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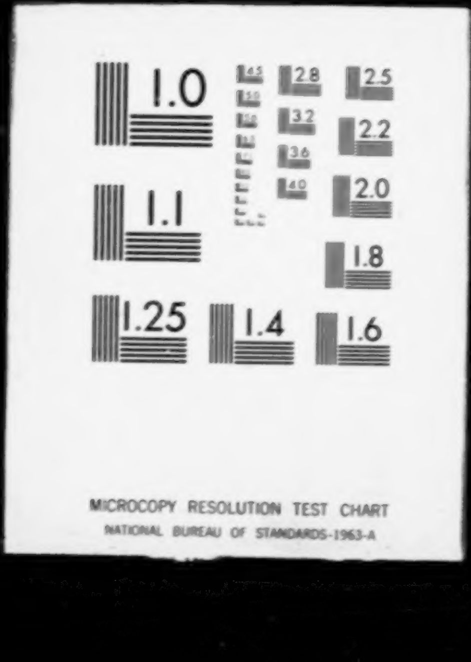
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THE MEXICAN TELESECUNDARIA: A COST-EFFECTIVENESS ANALYSIS

BY

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MARCH, 1973

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U.S. DEPARTMENT OF HEALTH,
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SUMMARY

Background

In 1972, members of the Institute for Communication Research at Stanford University, in conjunction with the Mexican Secretariat of Public Education (SEP), conducted an evaluation of the latter's *Telesecundaria* system, a six-year-old project using television to provide secondary school (grades 7-9) to students who, because of their distance from regular schools and other factors, would normally not be able to continue their education beyond the primary level. This report summarizes the large amount of field research that was carried out as part of this study by members of the Secretariat's Department of Audio-visual Education (Dirección General de Educación Audiovisual y Divulgación) with Stanford's collaboration.

The study had three basic objectives: 1) to evaluate the *Telesecundaria* system and particularly its cost-effectiveness; 2) to suggest possible strategies for its improvement; and 3) to make Mexico's experience with *Telesecundaria* available to other nations who are also anxious to use television and other technologies to expand educational opportunity.

Because strategies for extending or reforming education often require increased expenditures of scarce public funds, they are limited by very real financial constraints. For this reason, decision-makers seek alternatives that are both pedagogically sound and within the bounds of present and projected future budgets. By analyzing *Telesecundaria's* current performance and costs alongside some alternative strategies for the expansion of secondary education in Mexico, the evaluation was designed to contribute in a positive way to the decision-maker's task.

Although the *Telesecundaria* is meant to complement rather than compete with the regular secondary school system, a comparative cost-effectiveness framework was selected for the evaluation. Accordingly, samples of 9th grade classes from the *Telesecundaria* and the regular secondary were selected randomly from within a four state region, and the input and output characteristics of the two systems were compared. Costs of the two systems were analyzed in detail as were the achievement levels and attitudes of students. The systems' current and potential abilities to satisfy educational demand and produce more secondary graduates were also evaluated in some detail.

Input characteristics of the Telesecundaria and regular secondary schools

School and community characteristics. The majority of *Telesecundaria* schools (teleaulas) consist of two or three rooms which have been leased, donated, or built by local parents' associations. In contrast, regular secondary schools are larger, more formal, institutions which are financed by the federal government. Regular secondary schools are better equipped than teleaulas, although most teleaulas do seem to provide sufficient reference materials and laboratory equipment to enable teachers to follow-up the televised lessons.

Students. Boys outnumber girls in both instructional systems, and the ratio of boys to girls is substantially higher in rural areas. Telesecundaria students live in the more rural areas and are both older and poorer than their counterparts in regular secondaries. The parents of regular secondary students are better educated than the parents of Telesecundaria students. They also have been able to provide their children with better primary schooling and more educational experiences of all kinds. These facts help explain the higher general ability scores assumed for students in regular secondary schools.

Teacher characteristics and classroom behavior. Telesecundaria teachers, known as coordinators, are certified primary school teachers who have received some special training in the utilization of television. They are paid by the federal government and are given a bonus for their work in Telesecundaria. Unlike regular secondary school teachers, who are subject specialists, the coordinators teach all the subjects in a particular grade. Guides geared to the television lessons are provided to assist them in the classroom.

In an observation study of classroom teaching behavior, few significant differences were found between Telesecundaria coordinators and regular secondary teachers. Student participation in the form of questions or group work was rare in both groups, although the presence of these activities in a few classes related positively to student achievement in mathematics and Spanish. Outside of the blackboard and television, classroom teachers made little use of other audiovisual materials. The lecture method of teaching and rote memorization predominated in both instructional systems.

Costs. Telesecundaria is a much less expensive instructional system than the regular secondary school. Owing to the financial and administrative responsibilities borne by the local communities and also to the substitution of primary school teachers for secondary teachers in the classroom, the Telesecundaria is less expensive in virtually all cost components: administration, facilities, teachers, and student expenses. In the cost components applicable to both systems, the costs of Telesecundaria amount to approximately $125 per student per year as compared to $200 per student per year for regular secondary school -- a savings of almost 40 per cent for the Telesecundaria. The Telesecundaria adds approximately $26 per student per year for television. This additional expense brings Telesecundaria's total cost per student to $151, a figure still 25 per cent below that of regular secondary.

Costs were analyzed in a number of different ways to see: 1) how much it would cost to expand regular secondary schools to the areas now served by Telesecundaria, and 2) how the systems differ in their ability to satisfy educational demand

and to produce secondary graduates at different budget levels. If the regular secondary schools were expanded to the environment currently served by the Telesecundaria, the costs would be at least 50 per cent greater than those currently incurred by Telesecundaria. Furthermore, with only 10,000 students enrolled in the system, the Telesecundaria is at a break-even point with the regular secondary on a cost per student basis. At increased enrollment levels, the cost differential would increase in favor of Telesecundaria, approaching a minimum theoretical value of $130 per student per year with a million pupils in the system. In terms of cost, then, the Mexican Telesecundaria is an efficient way to extend educational opportunity.

Output characteristics of the Telesecundaria and the regular secondary schools

Learning and general ability. To compare student learning in the two instructional systems, achievement tests in mathematics, Spanish, and chemistry were administered in sample 9th grade classes at the beginning and end of the second semester of the 1971-72 school year. The results showed that, although the regular secondary students obtained roughly equal scores on the pre-tests, Telesecundaria students gained more on the achievement tests over the course of the semester. Detailed analyses of the learning data revealed no striking differences between the two groups. It was concluded that students in the two systems are learning with about the same degree of success.

Learning was related strongly not only to the students' general abilities, but also to their origins. Urban students in both systems outperformed their rural counterparts on all measures of achievement and general ability. On the basis of this finding, decision-makers might reconsider the traditional policy of expanding educational opportunity at the secondary level without regard for the special handicaps and learning difficulties that rural children often endure by virtue of their underprivileged backgrounds.

Aspirations and attitudes toward change. Students in both instructional systems hold high educational and career aspirations. More than half expressed the desire to continue their studies beyond the secondary level. *Telesecundaria* students were somewhat less ambitious than their peers in regular secondary schools, and boys held higher hopes than did girls. Aspiration levels were strongly related to the students' backgrounds (i.e., urban vs. rural origin), as well as to their levels of achievement and general ability. On an attitude scale designed to measure the students' views toward social change and modernization, *Telesecundaria* students demonstrated a somewhat more conservative response pattern, although the two groups held quite similar opinions in most areas.

A desire to leave the countryside was evident in the rural students' answers to several survey questions. A lack of attractive job opportunities in the rural areas, coupled with the appeal of city life, seem to encourage urban migration among secondary students in most developing countries. If this trend persists in Mexico, and if the school system fails to replenish the rural areas with trained manpower, the policy of extending educational opportunity might run counter to Mexico's goals for rural development.

Follow-up of Telesecundaria graduates. With the help of the _Telesecundaria_ coordinators, an effort was made to find out what recent graduates of the system were doing and whether or not their aspirations had been fulfilled. Unfortunately, because of difficulties in obtaining an adequate response rate among the coordinators, this project was not carried to a successful conclusion. However, in the three states where an acceptable response rate was obtained, approximately 45 per cent of the 9th grade graduates were enrolled in some advanced academic or training program and 30 per cent were employed, while the remaining 25 per cent could not be accounted for. While a majority of the graduates apparently stayed in their local communities and did not migrate to a city, more follow-up studies of this kind would be needed before definite trends could be identified.

Attitudes toward Telesecundaria. _Telesecundaria_ students in the four-state region were quite positive in their responses to a series of statements designed to tap their attitudes toward instructional television. Favorable answers were elicited on all items, although a sizable minority of students (25 percent) claimed to have trouble seeking the telelessons clearly. When asked whether they would transfer to a regular secondary school should the opportunity arise, only 16 per cent of the *Telesecundaria* students said they would definitely do so.

The future of Telesecundaria

The Mexican *Telesecundaria* has proven to be a highly cost-effective system for extending educational opportunity. It has relied heavily upon the initiative and resourcefulness of rural communities to provide the essential school facilities that the federal government customarily furnishes. By employing primary school teachers and television, the *Telesecundaria* has demonstrated that old and new educational resources can be mobilized in unique ways to solve special problems or meet special needs. The popularity of the *Telesecundaria* is reflected in the fact that, in recent years, the growing number of requests for *teleaulas* have had to be turned down because of the SEP's inability to provide additional primary school teachers to act as classroom coordinators.

Despite the service the *Telesecundaria* has rendered to date, it has been vigorously attacked in the Mexican press and elsewhere as a second-rate educational system. In a new spirit of reform, the current director of *Telesecundaria* has sought to improve program quality and redefine various administrative responsibilities for the system. Only time will tell whether leaders of secondary education within the SEP will accept more responsibility for a system about which they have deep misgivings.

In the long run, there are many alternative strategies for the use of television in Mexico. The Telesecundaria could be allowed to wither away, or it could be expanded through a national network to cover many more students. An "open" instructional system using television could be developed to reach students of all ages in their homes. The task confronting Mexico's educational planners, therefore, does not seem primarily to be one of choosing among available technologies, but rather one of rethinking educational priorities in terms of development needs and subsequently defining more efficient instructional systems to implement those policies.

Scope of this report

The report is organized in the following manner:

Chapter I discusses the characteristics of Mexico's Telesecundaria along with the methodology that guided the evaluation.

Chapter II compares the input characteristics or components of the television and regular secondary school systems, as well as their related costs.

Chapter III compares the overall performance of the two systems in terms of their cost per graduate and their ability to satisfy educational demand.

Chapter IV analyzes student learning and attitudes as outputs of the two systems and relates them to the inputs described in Chapter II.

Chapter V uses the information presented in previous chapters to draw general conclusions and to suggest some possible alternative for the use of television in Mexico.

CHAPTER I

BACKGROUND TO THE STUDY

Characteristics of the Telesecundaria System

Faced with a large school age population and a concomitant increase in educational demand at all academic levels, the Mexican government has turned to new educational technologies, principally radio and television, to supplement the services of and alleviate the pressures on its traditional school system. The Telesecundaria is the largest and most important undertaking of this kind in Mexico today. It uses television to provide a full, three year secondary education to students who, for a wide variety of reasons, would not otherwise have access to schooling beyond the 6th grade.

In 1965, the number of primary school graduates unable to enter secondary school in Mexico was over 180,000 or approximately 37 percent of the previous year's 6th graders. The lack of opportunity at the secondary level was most acute in the rural areas where the number of primary school graduates is still relatively small but where there have not been sufficient funds to provide either secondary schools or qualified teaching personnel. The vast majority of Mexico's rural communities (those with less than 2,000 inhabitants) produce fewer than thirty 6th grade graduates per year, and under such circumstances the government has not felt it economically feasible to provide the same kind of secondary schools found in larger Mexican towns and cities. For these reasons, a group of educational planners and mass media specialists within the Direccion General de Educacion Audiovisual y Divulgacion (DGEAD), a division of the Secretariat of Public Education (SEP), inaugurated the *Telesecundaria* system.

Telesecundaria began cautiously and on a small scale in September, 1966, with closed-circuit broadcasting to an experimental school in Mexico City. Eighty-three 7th graders divided into four classes received televised instruction in the standard subjects. Three of the classes had regular teachers to help utilize the television lessons; one class received the lessons without the aid of any classroom personnel. An evaluation was performed at the end of the 1966-67 school year, and the experiment was deemed a success.

The following year, open broadcasting began to 6,569 7th grade students in 304 classrooms scattered throughout eight states. As Table I-1 illustrates, the *Telesecundaria* expanded rapidly in its first three years. By 1970, *Telesecundaria* was serving over 5 percent of the secondary students in its eight state region or approximately 3 percent of the entire Mexican secondary school population.

TABLE I-1

Student Enrollment in Telesecundaria

	1968	1969	1970	1971	1972
7th grade	6,569	10,916	12,175	14,499	12,432
8th grade		5,324	8,240	9,459	9,194
9th grade			5,473	6,997	7,350
Totals	6,569	16,240	25,888	30,955	28,976

Source: DGEAD data.

Unlike most other educational television systems which have been developed in the last decade, the Mexican Telesecundaria has been designed to complement rather than reform or replace the traditional secondary school system. Its basic purpose continues to be the extension of secondary education to young people who have previously been denied such opportunity. The system's administrators also feel that television can help achieve other important educational objectives, such as providing a pedagogical example to classroom teachers throughout the reception area and offering out-of-school education to people who did not finish secondary school but who are able and anxious to do so in their own homes. Students enrolled in the Telesecundaria have equal official status with those in the traditional system. They meet the same requirements for admission with the exception of the entrance exam and receive the same diplomas, although a secondary school diploma does state whether it was awarded by a teleschool or a regular one. So far, approximately 18,000 students have graduated from the Telesecundaria system.

While retaining the identical curriculum and goals of the traditional Mexican secondary school system, the Telesecundaria employs a mix of national and community resources. In place of large, federally financed school buildings, Telesecundaria classes customarily meet in space provided by the local communities. Such space consists of one, two, or three rooms (designated teleaulas) donated by the municipal government, local cooperatives or other social service agencies. Occasionally, space is given by a local patron or by one of the students' families. In communities where interest in the Telesecundaria runs particularly high, parent organizations (patronatos) have been instrumental in raising money for the construction and maintenance of permanent facilities.

Instead of fully-accredited and specialized secondary school teachers, the Telesecundaria relies upon classroom coordinators (maestros coordinadores) to oversee all instruction. The coordinators are drawn from the ranks of 5th and 6th grade primary school teachers and they are paid by the federal government. Unlike their counterparts in the traditional system who specialize in one subject, Telesecundaria coordinators are assigned to one class of students whom they must instruct in the whole range of 7th, 8th or 9th grade subjects. The coordinators are provided some special training in the use of television and are supplied with a monthly outline and schedule of the topics to be covered in each telelesson. Workbooks to assist students in the daily utilization of teleclasses are prepared by the DGEAD and distributed at low cost through commercial bookstores.

The television teachers and producers who are responsible for the development and presentation of the broadcast lessons are recruited from the traditional school system on the basis of their subject specialties, pedagogical skills, and, in the case of the television teachers, their poise on camera. Television teachers are hired on an hourly basis and given special training in elocution, the techniques of television teaching, script-writing, and the use of audiovisual aids. Approximately thirty television teachers have been trained to date. Producers are given extensive technical training in audiovisual instruction as well as studio management. Their selection and training reflects a basic Telesecundaria policy that it is better to train academic specialists to be television producers than to expect experienced producers to become academic specialists.

In a typical week, students receive 30 televised lessons divided among the various subjects and vocational activities listed in Table I-2. Teleclasses average 20 minutes in length with the remaining 40 minutes of each class divided between preparation and follow-up activities supervised by the classroom coordinators. Teleclasses are broadcast between

7:45 A.M. and 2:00 P.M., Monday through Friday, with Saturday morning being reserved for broadcasts to the classroom coordinators. To accomodate a very tight broadcast schedule, transmissions to the three secondary grades are staggered so that a twenty minute lesson to the 7th grade is followed immediately by one to the 8th grade, and finally by one to the 9th grade.

TABLE I-2

Telesecundaria Subjects by Grade

	Subjects	
7th grade	Spanish Mathematics Biology World History English	Civics Art Physical Education Vocational Training
8th grade	Spanish Mathematics Biology English Mexican History	Mexican Geography Civics Art Physical Education Vocational Training
9th grade	Spanish Mathematics Physics Chemistry English	Civics Contemporary History Art Physical Education Vocational Training

Production activities of the _Telesecundaria_ are centered in four studios maintained by the DGEAD in Mexico City. The large number of subjects broadcast to three grades, and the fact that almost all teleclasses are broadcast live, are powerful incentives for using studio time efficiently. Each teleteacher has only one hour in the studio to rehearse and deliver a 20-minute lesson.

All Telesecundaria lessons are transmitted over XHGC-TV, Channel 5 in Mexico City, or over XHAJ-TV, Channel 6, a repeater station in Las Lajas, Veracruz. Mexican law requires commercial broadcasters to donate 12.5 percent of their broadcast time for government use, although this rule has rarely been enforced. Channel 5 has far exceeded this requirement, donating over 40 percent of its broadcast day to Telesecundaria. Despite Channel 5's generosity, the growth of the Telesecundaria system has been limited by the fact that it must rely solely on that channel. Coverage has been confined to those areas able to receive Channel 5's signal: the Federal District, and the states of Mexico, Hidalgo, Morelos, Oaxaca, Puebla, Tlaxcala, and Veracruz. A project was initiated in 1969 to send taped lessons by plane to the northern state of Sonora, but this effort was discontinued because of administrative and scheduling difficulties.

The Methodology of this Study

Two distinct approaches may be taken in evaluating an educational system. The first attempts to answer such questions as these: What skills and attitudes should be developed in young people? What subjects should they be taught? How many graduates should be produced? These questions deal with what an educational system should be producing. An attempt to answer them requires that evidence be gathered concerning the cost and benefits to society of different educational activities. This is cost-benefit analysis; and it tends to assume that present (or past) costs reflect efficient uses of educational resources.

Cost-effectiveness analysis, on the other hand, examines the efficiencies of alternative methods for using educational resources. This second type of analysis provides tentative recommendations on how to produce something; it does not question what set of outcomes to produce. Thus, cost-effectiveness analysis is concerned either with minimizing the cost of obtaining a given set of outputs, or with maximizing the outputs of a system at a fixed level of expenditure.

Because the present evaluation examines how well alternative instructional systems are performing at the secondary level in Mexico, the cost-effectiveness framework was selected. Accordingly, the Telesecundaria and the Ensenanza Directa* systems are compared in terms of their relative costs and effectiveness. In addition, several alternatives to these two forms of secondary education are evaluated in regard to their probable effects in improving the overall efficiency of the secondary school system. The current goals of Mexico's school system are taken for granted throughout the analysis; however, in Chapter V, some possible alternative educational goals are discussed.

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* Ensenanza Directa refers to Mexico's regular academic secondary schools and not to technical or vocational schools which also enroll primary graduates.

By structuring this evaluation as a comparative cost-effectiveness study of alternative educational strategies, it is hoped that the study will be directly relevant to decision-makers. Many previous studies of educational technology projects, even when well executed, have been of limited practical value to decision-makers: first, because they have examined only the effectiveness of a single approach and did not evaluate alternative means of accomplishing the same educational tasks; and, second, because costs were frequently not analyzed and compared. If the effectiveness of only one educational strategy is considered, it is very difficult to decide whether it is the most sensible strategy to pursue when there could well be other instructional techniques that could do a more effective job.

When several instructional systems are compared on some criteria of teaching effectiveness and one system is found to be "better" than the others, it may still be very difficult to decide which instructional system should be adopted without some consideration of the relative costs of the different systems. If a new and "better" system costs substantially more than the current one, it is necessary to consider how well the current system could perform if the cost differential were applied to improving it.

Imagine, for example, an educational system that is experimenting on a pilot basis with instructional television in hopes of improving what is considered to be a generally low caliber of mathematics instruction. Suppose a comparative study of the pilot project and the ongoing system indicates that student achievement in mathematics has increased by 20 percent with the instructional television system. Should ITV therefore be adopted on a national scale?

In terms of relative teaching effectiveness, the answer would apparently be "yes"; however, if the full-scale implementation of such an innovation were projected to cost $30 more per student per year than the ongoing system, the answer might not be so clear-cut. There might be several other ways of spending an extra $30 per student per year even more effectively than on a national ITV system. Assuming an average class size of 40, it would be worth asking whether there might be some better way to spend the equivalent of $1200 per class per year.* In many developing countries, for example, such a sum could provide the yearly salary of an additional, full-time classroom teacher. Or, perhaps, the $1200 per class per year could be spent on in-service teacher-training in mathematics, or on new learning materials for students.

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* There is also the important question of whether or not the 20% increase in student achievement is worth $30 per student per year. Cost-benefit analysis would be needed to attempt to answer this type of question.

While it might not be possible to examine thoroughly every possible use of additional funds, evaluators should investigate costs and effectiveness in terms of alternative educational strategies. Comparative cost-effectiveness analysis provides the most useful framework for carrying out a system evaluation in this way.

To execute this type of analysis on Mexico's Telesecundaria and the Ensenanza Directa it is necessary to specify at the outset what is meant by effectiveness in terms of the measurable outputs of the school systems. Second, the inputs or resources that go into each alternative must be identified. Third, those inputs must be translated into their component system costs. Finally, the inputs and outputs should be linked with mathematical or statistical models that relate changes in the outputs to changes in the inputs.

It is also useful to structure such a comparative analysis on two levels of aggregation. At a disaggregated, microscopic level the effects of a system on the individual student are considered. Student outcomes such as achievement test scores and attitude measures are examined in terms of their relationship to the type of school system and the family and social background that the student has been exposed to. The results of such an evaluation allow one to compare the instructional effectiveness of different systems.

At a more aggregated, macroscopic level the evaluation examines the relationship between the overall outputs of a system and its overall inputs. The system outputs considered at this level are measures of the systems' enrollment capacities and their ability to produce graduates. Such system outputs are determined by analyzing the relative enrollment limitations put on each system by a fixed budget. It is at this level that the "cost" part of the cost-effectiveness analysis really comes into play. Given information on the component costs of a system and the particular types of input combinations the system uses, it is possible to determine the number of teachers, classrooms, and other inputs that could be provided by a certain budget. This can be translated easily into the maximum student enrollment possible with a particular system and budget. Given additional figures on drop-out, repetition, and promotion rates, this information can also be translated into the number of graduates the system is capable of producing. If a growing budget is considered, the results of the evaluation at this level will be a comparison of the enrollments and number of graduates that could be produced by different systems over time.*

The methodology outlined above will be followed in the present evaluation. Some alternatives may be clearly better than others (e.g. better on every output dimension for any fixed budget), while others may be better in one respect and poorer in another. In the latter case, educational decision-makers will have to evaluate the pedagogical, economical, political and social implications of various potential outputs to decide which is the best overall instructional system.

---

* The model by which this macro-analysis is accomplished, as well as the general methodology discussed here, is developed more fully in Dean Jamison, "Notes on Cost-effectiveness Evaluation of Schooling in Developing Countries," Institute for Communication Research, Stanford University, 1972.

CHAPTER II

Input Components of the Telesecundaria and Enseñanza Directa Systems

In this chapter the input components of the Telesecundaria (henceforth TS) are compared with those of the older, more prestigious, and much larger system of direct classroom teaching, the Enseñanza Directa (henceforth ED). To understand the similarities and differences between the two systems, and to provide a framework for the subsequent interpretation of learning and attitude output data, the systems were examined on four dimensions: school and community characteristics, student characteristics, teacher characteristics, and costs.

At the outset of the study, random samples of 9th grade classes were selected from each instructional system. The classes were chosen from four geographic areas: the Federal District of Mexico, and the states of Mexico, Hidalgo, and Morelos. These areas were selected because: (1) they were large and diverse enough in economic as well as geographic terms; and (2) because they were all close enough to Mexico City to facilitate classroom observations as well as test and survey questionaire administration.

Table II-1 presents the student samples according to state and instructional system. In all, fifty-eight 9th grade TS classes containing 1,236 students were included in the sample along with twenty-three 9th grade classes from the ED totalling 1,101 students. The sampling strategy was intended to provide a minimum of 1,000 students from each system and because ED classes are customarily much larger than those in the TS, fewer of them were needed to obtain the desired number of subjects.*

Table II-1

Student Samples by Area and Instructional System

	Distrito Federal		Valle de Mexico		Hidalgo		Morelos	
	TS	ED	TS	ED	TS	ED	TS	ED
No. of Classes	15	10	15	4	15	4	13	5
No. of Students	384	462	313	208	252	183	287	248
Average Class Size	26	46	21	52	17	45	22	49

Totals	Telesecundaria	Enseñanza Directa
	58 classes	23 classes
	1236 students	1101 students
	21 average class size	47 average class size

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* The four sampled states were chosen from among the eight in which TS exists. This was done after an analysis of test scores indicated that these four adequately represented the range of achievement in all TS classes. The ED sample, although random, is not representative of all ED schools throughout Mexico. However, since ED and TS classes were sampled randomly from the same states, comparisons within the four state region are valid.

School and Community Characteristics

Included in both the teacher and student questionnaires that were administered in the sample classes were a number of questions concerning the schools and communities in which the two systems were operating. It was known that the *TS* had grown up largely in response to the demand for secondary education in Mexico's rural areas where regular schools were not available, and that certain qualitative differences were bound to exist between the two school systems as well as the communities in which they operated. The surveys were designed to verify and, where possible, quantify such differences. The results of this analysis are summarized below.

Although the TS and ED systems overlap in many areas, teleaulas are generally located in poorer and more rural communitites. This fact was established by checking the distribution of schools in the four sample regions and by asking teachers to estimate the average monthly family income of their students. The wider dispersion of *teleaulas* throughout the states and their presence in very small communities were indication that the newer system was reaching different elements of the Mexican population than those served by the larger, more urban-based *ED*. Evidence that the *TS* serves poorer students was found in the fact that two-thirds of the sample teachers in this system estimated their students' mean family income to be less than the peso equivalent of 80 U.S. dollars per month while only 43 percent of the ED teachers made an equivalent estimate. In contrast, 30 percent of ED teachers judged their students' family incomes to be over 160 dollars a month as against only 2 percent of the TS instructors.

Teleaulas tend to be small and rather flexibly organized institutions rarely serving more than 75 students in three grades; ED are large formal institutions customarily serving more than 500 pupils. Teleaulas are housed in a wide variety of locations including municipal buildings and village cooperatives as well as rented private rooms. In contrast, the vast majority of ED schools are located in buildings owned and administered by the federal government. Such buildings generally have a minimum of ten classrooms as contrasted with the typical teleaula with only three or four rooms. The difference in school size, compounded by higher student teacher ratios, contribute to the greater sense of formality and organization apparent in the ED.

Teleaulas do not possess as many facilities or ancillary learning aids as the ED. This fact was not surprising given the small enrollments of most teleaulas and their comparatively low budgets. Considering these constraints, however, the local teleaulas do seem to provide students with most of the essential learning materials, at least according to the teachers who were surveyed. For example, three quarters of the respondents from both systems said that their schools had a science laboratory, and a quarter of the *TS* instructors claimed to have a school library versus a third of their *ED* counterparts. Unfortunately, it was not possible to determine in any systematic way the size or, more importantly, the degree to which these facilities are actually utilized on a day to day basis.

Student Characteristics

Survey questionnaires were administered to students in the sample classes to determine what socioeconomic characteristics were common to both *TS* and *ED* students, and which ones were common to one group more than the other. Research in many countries has revealed that differences in social class and the level of parents' formal education, as well as mass media exposure, can influence how well students learn and how long they stay in school. In the paragraphs that follow, a number of important differences between the sample student populations are summarized.

Boys outnumbered girls in both systems, but the ratio of boys to girls is substantially higher in the TS classes. In the Federal District and in the Valley of Mexico boys outnumbered girls almost three to one in the *TS* classes. Throughout the *ED* system, male majorities also predominated, but the ratio of boys to girls never surpassed two to one.

TS students are generally older than ED students. The average age for the 9th grade TS students was 16 years 3 months as opposed to 15 years 0 months for the ED students. Approximately equal proportions of younger and older students was found attending TS classes in the sample regions; but within the ED, the vast majority of younger students were located in Mexico City while older students predominated in the rural states of Morelos and Hidalgo.

Students from both systems come from large families (average of 8 persons living in the home) and, in most instances, both parents were present in the home. There was a higher rate of fathers dead or absent for the TS students, however, with 18 percent of the students of this group claiming that their fathers were not living with them.

Parents of TS students have less formal education than parents of ED students. The levels of parental schooling are presented in Table II-2. As the table shows, 66 percent of the TS fathers had not finished primary school versus 40 percent of the ED fathers. Looking at the other end of the scale, 24 percent of the ED fathers had some training beyond the secondary level versus less than 5 percent of the TS fathers. A parallel situation existed for mothers' schooling, and in both sample groups mothers' educational attainments were substantially below those of fathers.

Table II-2

Parents' Education by Instructional System
(percentages)

	Father's Education		Mother's Education	
	TS	*ED*	*TS*	*ED*
Did not study	10.1	4.5	17.8	8.3
Completed some pri.	56.0	35.1	53.9	38.9
Completed primary	16.0	19.3	15.4	18.6
Attended secondary	6.4	10.0	4.1	6.2
Commercial course	2.4	7.4	2.7	17.1
Advanced secondary and/or university	2.5	16.6	0.9	5.9

Fathers of ED students also have better jobs than TS fathers, a fact obviously related to their superior level of schooling. While only 11 percent of the *TS* fathers had jobs that required more than a primary education, 35 percent of the *ED* fathers held positions that could be termed middle level or professional.

Students from both systems come from homes where the mass media (newspapers, magazines, radio, television, and books) are present and are used extensively. The only noteworthy difference between the groups occurred on the variable of television ownership: 82 percent of the *ED* students claimed to have television sets in their homes versus 63 percent of the *TS* students. Despite this difference, however, only 20 percent of the latter group said they had not seen at least some commercial television the week before.

Teacher Characteristics and Behavior

Survey questionnaires were also administered to classroom teachers in the two systems, and 52 TS coordinators and 26 ED teachers from the sample classes took time to fill out and return the questionnaires. These are relatively small samples, particularly in the case of the ED group, but the data gathered still provides some useful information.

There were more men than women in both teacher samples, and the proportion of men to women teachers was higher in the TS. The 7:3 ratio of men to women in TS and the 6:4 ratio in ED also roughly paralleled the ratios of boys to girls in the respective systems.

As a group, TS coordinators had less general education and professional training than their ED counterparts. This finding was not surprising when one recalls that TS coordinators are drawn, generally, from the ranks of primary school teachers; teachers in the traditional systems are usually fully-qualified graduates of the National Teachers' College (Normal Superior). Despite this expected difference in training level, over 30 percent of the TS coordinators had also studied at some academic level beyond that required to become a primary school teacher.

ED teachers were older and had more formal teaching experience than the TS coordinators. Whereas the majority of teachers in both groups were between 26 and 35 years of age, 27 percent of the *TS* coordinators were 25 or younger. Yet, not one of the *ED* group was under 26. Differences in teaching experience were related to age. More than half of the *ED* teachers had begun their teaching careers before 1960, while the vast majority of the *TS* coordinators - 79 percent - had entered the profession since that time.

As part of an extensive classroom observation study carried out by the evaluation unit of DGEAD in 1972, the teaching methods of the sample teachers from both the *TS* and *ED* systems were evaluated. *TS* coordinators, who teach the full spectrum of secondary subjects with the aid of television, were observed in both mathematics and Spanish while the more specialized *ED* teachers were observed only in their subject specialties, in this case either mathematics or Spanish. The full results of this study have been published separately,[*] but a few of the most important findings are considered below as input characteristics of the two systems.

Despite differences in general education, professional preparation, and years of teaching experience, there are few significant differences in the classroom teaching behavior of the two teacher groups. In the vast majority of observations, teacher exposition in the form of lecture or dictation was the rule, with very little time being devoted either to dialogue with students or to the answering of students' questions. Indeed, in four out of every five observations, students never asked a question. Teachers often directed questions at their students, but such questions were posed only to maintain attention and/or to elicit information that the student had been expected to memorize. Few questions were asked that demanded an opinion of the student. In sum, there appeared to be little communication or interchange between students and teachers in either of the two systems.

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[*] Judith A. Mayo, *The Observation of Telesecundaria and Ensenanza Directa Teachers in Mexico*, Institute for Communication Research, Stanford University, 1973.

The blackboard is the only instructional aid used regularly by TS and ED teachers. Although most teachers claimed to have access to reference books and other learning aids, their classes demonstrated little evidence of the utilization of such materials. Again, in four out of five observations, the classroom teacher relied only upon the blackboard to embellish his exposition. On the average, two students per class were directed to the blackboard by the teacher to solve mathematical problems or complete other kinds of exercises. In most classes, the teacher dominated the use of the blackboard, employing it to convey problems or rules which the students would copy in their notebooks.

TS and ED teachers allow their students little opportunity to participate actively in the learning process, and students' participation is limited almost entirely to individual work at their desks. Individual work by students was observed less frequently in Spanish (15 percent of class time) than in Math classes (35 percent of class time), with little difference between TS coordinators and ED teachers. Nonetheless, an important difference was found in the amount of individual student work that was teacher-supervised: in TS classes, coordinators supervised their students' work an average of 23 percent of the time as compared with 6 percent of the time by teachers in the ED system.

ED teachers have more time and do a more thorough job of preparing their lessons than do the TS coordinators. This difference was most noticeable in the observations of mathematics classes where it appeared that 85 percent of the ED teachers had prepared a lesson plan. Lesson plans were present no more than half the time in the classes of the TS coordinators. Of course, the coordinators are responsible for all of the subjects taught in their particular grade and this implies that they must make numerous daily preparations to complement the televised lessons. ED teachers have an advantage in this respect since they are customarily responsible for only one subject matter.

The teaching behavior of TS coordinators changes markedly according to the subject they are teaching. Classroom observation actually revealed more changes in teaching behavior between subjects than between instructional systems. In other words, when the teaching methods of individual TS coordinators were compared in math and Spanish, the differences between them were greater than the differences observed between single-subject teachers in the ED system. This finding suggests that the nature of a particular subject or at least the manner in which it is presented in the official curriculum may affect strikingly the teachers' classroom behavior.

Costs of the Telesecundaria and Ensenanza Directa

In the first part of this chapter, differences in the community, student and teacher inputs to the TS and ED systems were examined. The use of different types of inputs generally implies different costs for any two systems. It is this difference in cost for TS and ED that will be examined in this section.

Before undertaking a cost analysis, however, there are several points that must be made by way of introduction. First, the costs summarized here and in succeeding sections are the total costs to Mexico as a whole. They include, in addition to government outlays, costs incurred by local communities, students' families, and other groups within the private sector.* Second, costs are analyzed on a component basis to enable the reader to see precisely how and why the two systems differ. Third, costs are compared on a per student basis because the great difference in size between the two systems makes a comparison of total system costs of only passing interest.* Fourth, because the burden of proof is always on a new system or new technology to prove its worth, the costs of the older ED system have been estimated conservatively (i.e., cost estimates are somewhat understated). Finally, the assumptions upon which the cost estimates rest are presented in more detail in Appendix B.

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* The opportunity costs of students are not considered in this analysis. If they had been, they would have increased the cost differential advantage of the TS because job opportunities in rural areas are fewer and lower paying than those in urban areas.

In almost every educational television project, technology has been an add-on cost,for it has supplemented rather than replaced the classroom teacher and other input components of the existing system. Mexico's TS can be viewed in such terms to the extent that television is added to the traditional components of a system. However, what distinguishes the TS and makes it viable for Mexico is that the traditional components of the system are much less expensive than comparable elements found in the ED.

Table II-2 reveals that the cost per student in 1972 was less for TS than for ED along the four principle traditional component categories -- administration, classroom teachers, facilities, and student expenses. There are relatively fewer administrative personnel throughout the TS than in the ED and much less effort is put into the central administration of TS. Furthermore, as discussed in the previous section, the classroom coordinators have less training than their counterparts in traditional secondary schools and thus they receive lower salaries. The teacher cost per student differential would be even greater than those shown in Table II-3 were it not for the fact that the average class size for the ED is twice that of the TS, thereby spreading ED's higher teacher cost over more students.

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* In 1972 the ED served 1,060,000 students at a total cost of ($211,664,000) while the TS enrolled approximately 29,000 students at a total cost of ($4,368,000).

The responsibility for providing classroom facilities in the TS system rests with the local parents' associations (*patronatos*), while in the ED system the state or federal government provides such facilities. The local *patronato* most often finds unused space in existing buildings to house a *teleaula*, although in some instances low-cost classrooms have been constructed with the donated labor of students' families. Furthermore, as discussed previously, the typical *teleaula* offers less than the typical ED school in the way of associated school inputs -- libraries, laboratories, workshops, etc. Both these circumstances serve to lower the relative cost of the TS facility. This differential in the facility cost per student would be even greater than shown here except for the larger class sizes and more efficient use of classroom space (double sessions) by which the ED system spreads its facilities' costs among many more students.

Table II-3

Annual Cost Per Student of ED and TS -- 1972*

Traditional Components	Ensenanza Directa	Telesecundaria
Administration	$ 50	$ 6
Classroom teachers	94	88
Facilities -- fully equipped classroom	28	11
Student costs -- books, uniforms, etc.	28	20
Sub-Total	$200	$125
ETV Components		
Production	$ 0	$ 19
Distribution	0	2
Reception	0	5
	0	26
Total Annual Cost per Student	$200	$151

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* The assumption underlying these estimations are explained in Appendix B. More detailed cost information may also be found there.

Student costs are lower in the TS because the guidebooks that are used in the teleaulas to accompany the televised lessons are less expensive than the standard textbooks used in the ED.

In sum, traditional components of the TS system are substantially less costly than those of the ED -- $125 per student vs. $200 per student, respectively. On the surface, it would also appear that the traditional components of the TS system, taken alone, would provide an inferior educational environment to that of the ED. However, TS adds educational television to the traditional components.

The costs of this innovation may be divided into three broad categories -- production, distribution, and reception. Production costs include outlays for studios, studio equipment and its maintenance, as well as the salaries of all administrative, technical, and television teaching personnel. Distribution costs are expenses incurred in the transmission of the televised lessons. They are relatively low in the TS system because Channel 5 donates the use of its facilities to the Secretariat of Public Education. The distribution costs in Table II-2 reflect only the costs of the actual use of resources -- the costs of power, personnel, and maintenance -- incurred by Channel 5 in its broadcast of TS. Reception costs are the annualized per student cost of one television receiver and its maintenance. All told, the ETV components added $26 per student to the cost of TS, yielding a cost per student hour of $.07, if we assume 400 hours of programming per grade per year in 1972, and a total cost per student of $151 compared to $200 for ED. In other words, TS was approximately 25 percent less expensive than ED on a per student basis.

In comparing the costs of different educational systems, it is not sufficient to consider only the amount of money spent on them; attention should also be directed toward who is paying these costs. Table II-4 breaks down the costs of TS and ED systems according to their funding sources. The local community pays a higher percentage of the costs for schooling within the TS system than with ED -- 24 percent versus 16 percent, respectively. This difference is not as large as might be expected given the TS's strong reliance on local initiative and participation; and it may be considered even less significant when viewed in absolute terms. Families of ED students pay approximately $32 per student per year* while families (and patronato groups) supporting TS students must spend approximately $36. Despite the fact that there are not overwhelming differences in the funding sources of the two systems, there is indeed a question of fairness to be raised here. Why must TS students who come from poorer families be forced to spend more, both in absolute and relative terms, for their education than students in the ED system who come from wealthier families?

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* The cost to students in ED is actually $4 per year greater than might be indicated by Table II-3 because the students pay a $4 annual fee. This fee is put towards meeting the component costs of the secondary school system.

Table II-4

Sources of Funding

	ED		TS	
	Cost/student	%	Cost/student	%
Government	$168	64%	$113	75%
Locality -- student families, patronato	32	16%	36	24%
Private Industry -- Channel 5	--	--	2	1%
Totals	$200	100%	$151	100%

Production costs of ETV programs are generally the basis for international comparisons, and for this reason they are presented in annualized form in Table II-5. A total of $560,800 is spent annually to produce approximately 3,600 twenty minute programs, yielding a cost per program of $156 or a production cost per hour of $467. Similar estimates for ETV projects in other countries indicate that Mexico's TS is probably one of the least expensive systems of its kind in the world.

Table II-5

Annual Program Production Costs of Telesecundaria *

(1)	Production Component		
	Personnel and Administration	$220,000	39%
	Teleteachers	104,000	19%
	Studios	15,200	3%
	Studio Equipment	49,600	9%
	Video Tapes	52,000	9%
	Maintenance	120,000	21%
(2)	Total Annual Production Cost	$560,800	100%
(3)	Annual Program Output (20 minute tapings)	3,600	
(4)	Production Cost/Program (2) ÷ (3)	156	
(5)	Production Cost/Hour (4) X (3)	467	

* The assumptions underlying these cost estimations of the various production components are explained in Appendix B. The costs presented are average annualized figures that are representative of any year after adjustments have been made for price changes. Costs are given in 1972 U.S. dollars.

Like most other educational technology projects, TS's per student costs would be expected to decline as its enrollment increases, provided other elements of the system do not change. This is because a part of the costs of an educational technology system are fixed costs; they do not vary with changes in the number of students in the system. The remaining costs that would accrue to TS or ED as a result of an expanding enrollment are variable costs in that they increase in proportion to the size of the system.

Table II-6 traces through the effect of changes in student enrollment on the per student costs of the TS and ED systems. In the ED system, the cost per student remains constant (because proportionately more money must be spent for each student that is added to the system), whereas in TS, as the fixed costs of production and transmission are spread over more and more students, the cost per student declines. With only 10,000 students in the system, TS becomes less expensive than ED, the difference becoming more pronounced as enrollments get higher. With 1,000,000 students in the system, the per student cost of TS approach its minimum theoretical value of $130.*

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* See the footnote in Table II-6 for the assumptions upon which the division into fixed and variable costs is based.

Table II-6

Annual Cost Per Student of ED vs TS as Student Enrollment Increases *

Enrollment	Enseñanza Directa	Telesecundaria				Total
		Traditional Component	ETV Component			
			Prod.	Dist.	Rec.	
5,000	$200	$125	$112	$10	$5	$252
10,000	200	125	56	5	5	191
30,000	200	125	19	2	5	150
50,000	200	125	11	1	5	142
100,000	200	125	6	1	5	137
500,000	200	125	1	-	5	131
1,000,000	200	125	1	-	5	131

* This table assumes increased enrollment for TS within its existing geographical limits and implies that production and distribution component costs of the ETV system are fixed costs. It is also assumed that students in an expanded system are to be supplied with the same combination of educational resources per student that has been provided in the past. This latter assumption implies that all traditional component costs and reception component costs are variable.

TS has proven historically to be a less expensive secondary school system than the ED ($151 per student vs. $200 per student), and, as Table II-6 illustrates, this cost differential would widen as enrollment for TS increased. However, there is a difficulty with making a direct historical comparison of this nature because the two systems are operating in quite different environments. By and large, ED functions in a more urban environment than does the TS. Its average class sizes are larger; it often uses double sessions; and it incurs substantially higher facility and administrative costs.

Given that historical costs reflect the pecularities of a particular environment, a more valid basis for comparison would be to imagine the two systems on equal footing. In other words, what would be the probable costs of expanding the ED system to serve the students currently enrolled in the TS?* Admittedly, it is difficult to forecast exactly what the costs of ED would be under such circumstances, but Table II-7 presents both "high" and "low" estimates on a per student basis.

For the low estimate, it is assumed that the ED system could operate with the same administrative, facility and student costs as the TS presently does. This would require the ED to cut down on its current level of administrative overhead, to build classrooms much more cheaply than at

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* In order to put the two systems on an "equal footing", it would also have been possible to consider the probable cost of using TS to serve the students currently enrolled in ED. As this would be most properly considered as an alternative for TS, it will be discussed in Chapter V.

Table II-7

Annual Cost Per Student of ED in the Environment of TS*

Cost Component	Alternative A** "Low"	Alternative B*** "High"
Administration	$ 6	$110
Classroom Teachers	203	203
Facility	11	90
Student	20	28
Total Annual Cost/Student	$240	$431

* Environment refers directly to the lower class sizes and classroom utilization faced in TS's situation as compared to ED's.

** Alternative A assumes ED in its new environment would face an average class size of 23 and single sessions, as well as be able to get by with administration, facility and student costs equal to what TS now spends.

*** Alternative B assumes ED in its new environment would still face an average class size of 23 and single sessions, but would have costs for the other traditional components based on historical assumptions for ED -- that is, high administrative and facility construction costs and relatively higher textbook costs (see Appendix B for the details regarding these assumptions).

present, and to lower textbook costs. However, even under these favorable circumstances, the teacher cost per student of ED would rise considerably above the historical level of $94 because the typical TS community would yield substantially smaller classes, while the cost of an ED teacher would be at least as high as it is at present.*

If ED were to expand into communities currently served by the TS with no change in the current procedures, the cost picture might more closely resemble that outlined as the "high" estimate in Table II-7. Here, teacher costs remain as in the "low" estimate, while the three other cost components reflect the historical pattern of ED financing. Thus, administrative costs are unchanged, but are spread over fewer students. Student costs are the same as under ED presently. In this "high" estimate, the total annual per student cost of ED rises to $435.

Based on the more valid comparisons presented above -- that is, estimating how the two systems would fare when asked to do the same job -- TS remains a much less expensive system than the ED. Furthermore, the future cost differential is even more favorable toward TS than that found by examining only historical costs. Even under the "low" alternative, the cost per student of ED is over 50 percent greater than that for TS ($240 per year vs. $151 per year). Yet costs are only part of the picture, and their meaning and true implications depend on the evaluation of the effectiveness of the two instructional systems. In the following two chapters, the effectiveness of the system will be critically examined.

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* In essence, this approach (using the "low" estimate) examines the relative costs of ED and TS and points out the trade-off that can be made in an educational technology system wherein lower teacher costs offset the costs of technology. The teachers used in the TS system would cost less than half as much as those in ED ($88 per student vs. $203 per student) if ED operated in TS's environment. This cost differential more than covers the cost of the ETV technology ($26 per student in 1972).

CHAPTER III

System Performance of the Telesecundaria and Enseñanza Directa

What effect have the different combinations of inputs represented by the TS and ED systems on the quantity of students receiving secondary schooling in Mexico and on the quality of that schooling? The present chapter will consider the quantitative part of this question by evaluating in economic terms the past and potential performance of the TS and ED. Chapter IV will evaluate and compare how well the two systems perform in terms of student learning and attitudes.

Measures commonly applied to evaluate the quantitative performance of an educational system include the number of graduates it can produce in a given period of time and its ability to satisfy educational demand. These measures are directly related to costs. Systems such as the TS and ED that exhibit different cost per student ratios are bound to produce different numbers of graduates and to satisfy different proportions of students wanting to enter school. By looking at how well TS and ED have performed on these criteria, a decision-maker should be able to determine how well, and at what cost, they could perform in the future.

Producing Graduates

A direct historical comparison of the numbers of graduates is obviously not too meaningful. ED functions with a budget almost 50 times that of TS and produces many more graduates.* A better way of making such a comparison is to consider the efficiency with which each system produces a single graduate. In cost terms, efficiency may be measured by the amount each system must spend in a given year to obtain one graduate. The previous cost analysis found the total cost of the TS system in 1972 to be about $4,368,000. With the system producing approximately 6,600 graduates in 1972, a cost per graduate of approximately $662 can be computed. For ED total costs in 1972 were found to be approximately $216,608,000. The number of graduates in 1972 was about 238,300, resulting in a cost per graduate of $909. In sum, in 1972 it cost 25 percent less to produce a TS graduate than an ED graduate.

Although cost per graduate computations reflect the overall performance of the two systems to date, they are not entirely satisfying from a comparative viewpoint. They are based on historical costs which reflect the different operating environments of TS and ED. These environments have effects that influence costs. For example, ED generally operates in more urban areas with larger class sizes and higher facility construction costs than TS. A more meaningful comparison of the two systems would result if one were to evaluate them on the same basis; that is, to examine their relative performance as if they were operating in the same environment. Perhaps the best basis for comparison would be to see how both systems would perform in the present operating environment of TS.* This situation was already considered from a strictly cost point of view in Chapter II. Now, one needs to examine how these costs affect how the educational systems might produce graduates. As Table II-6 illustrated, even under the best conditions (labelled ED(A), ED would have an annual cost per student of $240 if faced with the operating environment of TS (e.g. single sessions and a 23:1 student to full-time teacher ratio). The question is now to compare the overall system performance of ED(A) with TS.

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* The budget refers to the total annual cost of each system. Since not all the component costs are paid by the SEP, the budget referred to here will be greater than the amount allocated to either system by the SEP.

It is possible to compare ED(A) with TS in the same manner as ED was compared with TS, in terms of the cost per graduate of each system.** However, a more interesting method for measuring the relative effectiveness of the two systems in producing graduates would be to examine how many graduates each system could produce over time if they were given the same budget. Jamison (1972) describes a methodology for comparing two systems in this manner. The empirical information needed to do so is the total fixed cost and average variable cost per student, the growth rate over time of effective expenditures (defined as the growth rate of educational expenditures minus the growth rate of the costs of providing educational services)*, and the drop-out, repetition and promotion rates for each system. The cost information was derived in Chapter II, and the various flow-through rates can be estimated from SEP data and the results of a teachers' survey administered throughout the TS system in 1972.** Because we cannot know with certainty the rate of growth of effective expenditures, we must compute the results for a number of reasonable values.

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* The comparison may also be made on the alternative basis of how well TS could perform in the present operating environment of ED. As this comparison more properly constitutes an alternative use of TS, it will be examined in Chapter V along with other alternatives.

** Because ED(A) is a hypotetical system, it would first be necessary to make all the assumptions that are used for the flow-through model described below.

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* It is necessary to look at the growth rate of effective expenditures in order to determine the increase in purchasing power of the educational budget; that is, really just to know how many physical units of resource inputs can be bought with the new budget. See Jamison (1972) for a more detailed explanation.

** Examination of this data has indicated that both ED and TS have approximately the same repetition, drop-out and promotion rates. Repetition in both systems is nearly zero due to a system of make-up examinations. The drop-out rate between the seventh grade and the eight grade is 18% and between the eighth grade and ninth grade is 12%. The rate of graduation from the ninth grade is 90%. We will assume these rates to hold for the hypothetical ED(A).

Table III-1 illustrates the result of applying Jamison's flow-through model to ED(A) and TS. It is assumed that both systems began in 1972 with a budget of $4,368,000 (this was the total cost of TS for 1972). The number of graduates for each system in succeeding years is shown as a function of alternative rates of growth of effective expenditures. For example, if the effective TS budget increased 6 percent annually, the system would be graduating 16,000 students in 1985. With a 6 percent effective budget increase each year, ED(A) would only graduate 9,300 students in 1985. As might be expected given the difference in costs, TS always produces more graduates than ED(A) given the same budget.*

Satisfying Educational Demand

Similar results can be seen by examining the second dimension of overall system output -- the rate of demand satisfaction (RDS). This is defined as the percentage of entrants to secondary school in a given year relative to the number of primary school graduates from the previous year. The number of primary school graduates is an acceptable measure of the demand for secondary school services, while the entrants to secondary school constitute a

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* This is true because the flow-through rates are the same for both systems. If TS had a higher drop-out rate than ED(A), it would be possible for TS to graduate fewer students than ED even with lower system costs.

Table III-1

Number of Graduates of Telesecundaria vs Enseñanza Directa (A)*
(in thousands of students)

Year	Growth Rate of Effective Expenditures**				
	0%	3%	6%	9%	12%
			Telesecundaria		
1972	6.6	6.6	6.6	6.6	6.6
1974	8.1	8.1	8.1	8.1	8.1
1976	7.3	8.1	8.9	9.8	10.7
1978	7.1	8.6	10.1	11.9	13.8
1980	7.7	9.5	10.9	14.3	17.4
1985	7.4	11.0	16.0	22.7	31.8
			Ensenanza Directa (A)		
1972	4.2	4.2	4.2	4.2	4.2
1974	5.1	5.1	5.1	5.1	5.1
1976	4.6	5.0	5.5	5.9	6.4
1978	4.5	5.3	6.1	7.1	8.1
1980	4.8	5.8	7.0	8.4	10.1
1985	4.6	6.6	9.3	12.9	17.8

* It is assumed that ED began with the same budget in 1972 as TS and faced a per student cost of $240.

** The rate of growth of effective expenditures is defined as the rate of educational expenditures minus the rate of growth of costs of educational services.

reasonable measure of the degree to which that demand is satisfied.* This measure may be of particular importance to an educational planner because TS was instituted specifically to satisfy demand for secondary schooling in areas where ED was not meeting the demand.

Looking only at the eight-state region where TS operates, the primary system graduated 347,800 students in 1971, but only 229,200 students entered the regular secondary system in 1972, yielding an RDS of 65.9 percent. This left a gap of 34.1 percent; that is, 34.1 percent of the previous year's primary school graduates were not accomodated by the ED system. Table III-2 examines the relative ability of TS and ED(A) to help satisfy this unfulfilled demand for different rates of growth of effective expenditures. For example, in 1972 the RDS for TS was 3.6 percent whereas if ED(A) had been in operation instead of TS (with the same budget as TS), its RDS would have been only 2.2 percent. Table III-2 assumes that the growth rate of primary school graduates in the eight-state region served by TS is 8.0 percent annually (the average national growth rate for primary school graduates in the 1965-70 period). This implies that effective expenditures for either system must grow at a rate greater than 8 percent if the system is to

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* The rate of demand satisfaction as defined above is admittedly a very rough measure of the underlying concept that one would like to consider. Not all primary school graduates desire secondary schooling, nor do all secondary school entrants come from the ranks of the past year's primary school graduates. However, given existing knowledge and data limitations, the RDS measure is the best available.

Table III-2

Rate of Demand Satisfaction of Telesecundaria vs Ensenanza Directa(A)*
(percentages)

	Growth Rate of Effective Expenditures**				
	0%	3%	6%	9%	12%
Year	Telesecundaria				
1972	3.6	3.6	3.6	3.6	3.6
1974	2.8	3.1	3.4	3.7	4.1
1976	2.3	2.8	3.3	3.9	4.5
1978	2.1	2.7	3.3	4.0	4.9
1980	1.8	2.4	3.2	4.1	5.3
1985	1.2	1.9	2.9	4.4	6.5
	Ensenanza Directa (A)				
1972	2.2	2.2	2.2	2.2	2.2
1974	1.7	1.9	2.1	2.3	2.4
1976	1.5	1.7	2.0	2.3	2.6
1978	1.3	1.6	1.9	2.4	2.8
1980	1.1	1.4	1.9	2.4	3.0
1985	0.8	1.1	1.7	2.5	3.6

* It is assumed that ED began with the same budget in 1972 as TS and faced a per student cost of $240.

** The rate of growth of effective expenditures is defined as the rate of growth of educational expenditures minus the rate of growth of costs of educational services.

make any progress in reducing the unfulfilled demand.

Given the same money, TS can do a better job of reducing the unfulfilled demand for secondary school than ED(A). However, TS cannot really make any significant dent in the unfulfilled demand problem without a substantial expansion of its budget.

In this chapter, TS has been depicted as a more efficient system for producing graduates than ED. Furthermore, if ED were to attempt to do the same job as TS, the system would produce fewer graduates and contribute less to satisfying unfulfilled demand. The implications of these results are quite strong. If TS had been given the same budget as ED in its eight-state region in 1972, TS theoretically could have produced 50 percent more graduates than did ED and reduced the amount of unfulfilled demand to zero. However, before any final judgement can be made as to the relative worth of the two systems, it is necessary to evaluate the impact of each system on students.

Chapter IV

Outputs of the Telesecundaria and Enseñanza Directa Systems

The use of an input-output model in school evaluations has the advantage of relating what students learn in school with what they bring to school in the way of personal attributes and abilities as well as what the school provides in the way of teachers, facilities, finances and so forth. Such an analysis makes the results of an evaluation clearer in two ways: first, it helps decision-makers realize that learning or, more narrowly, achievement is part of a general process, influenced by a number of factors, some under their control (curriculum, teachers, methods of instruction, etc.) and others not (community characteristics, student background, socio-economic level of the state, etc.); secondly, it helps focus the decision-makers' attention on those factors that are within their power to improve.

The disadvantage of using an input-output model is that it is often limited to a strict cost-effectiveness analysis which narrowly defines the educational inputs and outputs and ignores many other important problems with the system as a whole. Efficiency is not the sole criterion that interests decision-makers. An educational system that is more efficient than another one in producing students with a certain level of learning may have serious social and political drawbacks that were not included in the assessment.

In order to give a balanced evaluation, the present chapter focuses on a strict output analysis. A final chapter reviews some of the serious problems that one or other of the two Mexican instructional systems must face, problems that do not fall within the limits of the input-output model but are nevertheless of importance to decision-makers.

1. Description of Evaluation Areas, Instruments and Procedures

The major output measures for the evaluation were elaborated on the basis of the main educational goals of Mexican secondary education and the problems facing *TS*. These were: achievement learning in mathematics, Spanish and chemistry at the beginning and end of the second semester of 9th grade; general ability tests in verbal, numerical, and logical thinking skills; student aspirations for further schooling, occupation, salary, and place of work; attitudes about change in modern life as well as opinions about television instruction.

A. *Achievement*: Limitations of time and personnel forced two decisions on the evaluators: first, to limit the subject matters for testing to three and then to choose a sample only from among third year secondary students (9th graders) in *TS* and *ED*. Mathematics and Spanish were selected because they are core subjects through all the primary and secondary grades and they are expected to provide skills highly valued by society. Science is a subject area that is stressed throughout the secondary curriculum and for this reason Chemistry was selected as the third course in which to measure student achievement. Third year classes from both systems were chosen because if there was an effect of the type of instruction, either by television or by traditional methods, the cummulative impact of these methods would be more likely to show up at the end of third year than at any other time.

A before and after design for the testing was adopted to gain a clear understanding or whether the comparative groups being studied began the semester equally. The tests in the three subjects were based on the official curriculum for the second semester of the third year. Fifty item (sixty in the case of Spanish) multiple choice tests were constructed by the members of the evaluation group of the DGEAD with the help of subject matter specialists and Mexican experts from the Planning Division of the Secretariat of Public Education (SEP). Items were written and reviewed. Then a pretest of items was made with a sample of students from Mexico City. Pretest results were analysed for levels of discrimination and difficulty and a final selection of items was made in light of these first results.

The same tests were administered twice to both samples. In February, tests were administered to TS classes by their classroom coordinators after they had been given careful instruction by the evaluation team, and several weeks later to the ED classes by members of the evaluation team themselves. No mention was made of a second testing at the time so that teachers and students would not be motivated to keep the test or prepare for a later test. When the second testing period was announced and carried out in the middle of June, teachers were not informed that the test would be identical to the one given before. Whatever the memory factor from the experience in February that may have influenced the results of the second test, this factor was equal for students of both samples.

B. Ability Testing: The need for some measure of general ability skills in addition to measures of achievement was important for several reasons. First, general skills in reasoning, numerical, and logical thinking are good predictors of how students will do in future academic careers. These skills are also useful indicators of general intellectual capacity and of the opportunity the child had had to develop such capacity at home and in school. The reason for the inclusion of such tests in this study, however, was not to predict how students would do in future studies but rather to serve as controls for comparisons between TS and ED students.

The logic of the need for this kind of control was developed before the evaluation was carried out. By its nature, TS serves a student group that is disadvantaged. In large cities and especially in the capital, TS students are those who have not found a place in the regular schools, usually as a result of previous grades or poorer scores on entrance tests. In rural areas, they are generally from smaller towns where no ED school exists or is likely to be built. Consequently, it was assumed that TS students had had fewer opportunities to develop general ability skills (regardless of innate capacity) and probably achieved less in school. In talking with a large number of Mexican educators in the year before the evaluation, there was a general consensus that TS students could not be expected to do as well on achievement as regular secondary students.

In order to control for these expected differences and make some reasonable comparisons between students from the TS and ED samples, it was thought that general ability tests could form a useful stratification or control variable. Stratification on general ability would alleviate the problem of having to compare better prepared students from priveleged backgrounds with less prepared students from disadvantaged backgrounds.

The tests of general ability were administered by members of the National Center for Educational Guidance (Centro Nacional de Orientación Education). The testing was carried out under strict administrative control of this group during March and April,1972. The three tests formed part of a larger battery that the counseling service ordinarily administers to the students of Mexico's technical secondary schools. The three that were used for control purposes were the Otis Beta (Form A), a reasoning and verbal ability test, an analogies test for logical thinking, and a test of number skills, developed and used by the group over a period of years.

Two circumstances prevented the full use of the general ability test as a control for achievement. First, students from ED schools did not take the tests when they were administered to the TS schools. Secondly, the first administration of the achievement tests in February showed none of the large differences that were expected between the two groups, and so the ability tests were deemed less urgent for cross group comparisons.

C. Student Aspiration: The purpose for evaluating student aspirations was to learn as much as possible about how students regarded their futures beyond secondary school. Would they want to continue their studies or begin work? Would they prefer to stay in their own communities or move to different ones? What kinds of jobs attracted students and how confident were they of eventually securing them? Answers to these questions are important not only to students themselves, but also to teachers and educational decision-makers responsible for preparing young people for useful roles in Mexican society.

Student aspirations are not formed only in school; indeed, there is ample evidence from other countries to suggest that individual interests, as well as previous experience at home, social class, and other factors may have greater influence on aspiration than schooling. Nevertheless, the amount of schooling seems to have a definite influence on various aspirations, not only for more education but for career choices, salary, and work situations. Unfortunately, the nature of the aspiration measures (a single questionnaire administered to ninth grade students in June, 1972) did not permit a judgment of what students' aspirations were before entering secondary school or during the course of the three year experience. However, the evaluation included considerable background information to help guide and interpret current levels of aspiration.

Information on aspiration was gathered in a questionnaire (cf. Appendix A for a complete translation of the instrument) administered to ninth grade students in the TS and ED samples at the end of the second semester. Coming so close to the finish of their secondary school careers, the questionnaire reached students at a time when they were probably thinking seriously about their futures. Specific items of the survey asked about the amount of additional schooling desired, the expectation of achieving that goal, job preferences, salary aspirations, place and type of work preferred, etc.

D. Attitudes about Change and Opinions about Telesecundaria

A small attitude scale on the theme of modernization and change in society was also applied to students in both samples in the survey questionnaire. Both the method and the scale had been tried before in El Salvador and had shown good reliability there. The idea that some measure of affective learning outside the strict cognitive area was necessary prompted the researchers to include this scale. Even though the study of attitudes did not represent a complete appraisal of the affective learning of secondary students, it was designed to show that some social attitudes important to the educational goals of secondary school could be evaluated. Furthermore, the relationship of these attitudes with cognitive learning would help give a more complete picture of the effects of schooling.

An additional attitude scale was applied to students in the TS sample only. This scale was designed to gauge student opinions about the television teaching system in their schools. At this point, when changes and improvements are being suggest for the TS decision-makers particularly need this sort of information or feedback.

2. Results of Student Output Measures

In the following pages the results of the output measures of students will be described. The general analysis will consist of a series of comparisons. A comparison between instructional groups (TS and ED) will be made first. Then the relationships between the particular output and input measures will be examined within each instructional group. This step will examine the pattern of relationships between output measures of achievement, general ability, aspiration, and attitudes with major input variables of state stratification, background and demographic factors to see what best predicts student learning and whether such relationships differ for TS and ED.

Major findings will be summarized in a series of conclusions set off in the text. Few tables will be given here, but readers interested in more detail will find additional tables in Appendix C.*

A. Learning Results: Achievement and General Ability Tests:

1. Comparison between TS and ED Groups: For the purposes of the cost-effectiveness part of this study the basic comparison was made between two instructional groups: students taught by the TS system and those from the ED taught by regular secondary school teachers. Results of

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* The analyses reported here are not exhaustive. Some more thorough analyses have been done at this writing but more are needed. It does not appear that the conclusions drawn here will be changed by more complete analysis of the data, rather they will be refined and perhaps extended.

the three achievements tests are seen in Table IV-1. They may be summarized as follows:

> Result 1: Whereas both TS and ED groups started more or less equally, the TS groups gained slightly more over the semester in Mathematics, Spanish and Chemistry.

Whether differences on final test scores or gain scores are statistically significant or not does not seem to be important to this context. Achievement learning as measured by these tests of the two instructional groups seems to be about equal, with TS student having perhaps a slight edge.

2. The Influence of Input Factors on Achievement: This section follows from the major conclusion concerning the overall achievement learning within TS and ED. Once this learning result has been stated, one needs to examine more thoroughly what the process was and what factors help account for it so that decision-makers can use the information more precisely.

a. State or Geographic Zone: Both samples of TS and ED were stratified according to four administrative and geographic zones which include the Federal District of Mexico City (DF), Valley of Mexico (part of the State of Mexico surrounding the Federal District), Hidalgo (the state bordering the State of Mexico to the north and about two hours by car from the capital), and Morelos (the state to the south of DF about one or two hours by car). Such a

Table IV-1

Results of Before and After Achievement Testing for Telesecundaria and Ensenanza Directa

Telesecundaria (TS)

Subject Matter	Means	Std. Dev.	Gain Score	No. of Students*
Math 1 (Feb.)	20.24	4.84		1,151
Math 2 (June)	25.92	6.74	+5.68	
Spanish 1 (Feb.)	26.39	6.62		1,110
Spanish 2 (June)	31.50	8.44	+5.11	
Chemistry 1(Feb.)	18.06	4.25		1,132
Chemistry 2(June)	24.31	6.15	+6.25	

Ensenanza Directa (ED)

Subject Matter	Means	Std. Dev.	Gain Score	No. of Students*
Math 1 (Feb.)	20.15	5.02		836
Math 2 (June)	22.76	5.86	+2.61	
Spanish 1 (Feb.)	24.54	6.72		781
Spanish 2 (June)	27.19	6.84	+2.65	
Chemistry 1(Feb.)	18.49	5.02		713
Chemistry 2(June)	22.70	6.27	+4.21	

* Number of students are those who took both tests.

stratification of the sample was necessary since large cultural and socio-economic differences exist between the capital or central urban area of the country and almost all of the lesser urban centers outside of three or four major cities. Although data were coded by level of urbanization as well as by state, difficulties in coding made results from the urbanization analysis somewhat questionable. The state stratification, however, revealed such striking and consistent differences that from it has emerged an approach to the analysis that may have important implications for decision-makers. More will be said about this at the various parts of each output analysis and in the discussion of conclusions in Chapter V.

When the achievement scores of the two groups are stratified according to state (as seen in Tables IV-2 and IV-3), the second major learning result emerges:

> Result 2: Change scores on achievement tests indicate a strong pattern of state differences, consistent across the three tests. This pattern shows more gain in learning in the more urban states of DF and Valley of Mexico, less in the more rural states of Hidalgo and Morelos.

This pattern is found without exception in TS results, and although not perfectly replicated in ED results, it is generally found there as well. How does one explain this strong pattern in the achievement data? What is it about the different states that would cause such differences in learning? Would these differences also show up in other output variables in the same order? The answer to these questions will be examined in looking at the relationship of other variables to achievement.

Table IV-2

Results of Before and After Achievement Testing for *Telesecundaria* by State

Area	No.Students	Mathematics		
		Mean(Feb.)	Mean(June)	Gain
Federal District	353	20.28	28.84	+8.56
Valley of Mexico	300	21.46	26.85	+5.39
Hidalgo	226	18.89	23.94	+5.05
Morelos	272	19.96	22.73	+2.77

		Spanish		
		Mean(Feb.)	Mean(June)	Gain
Federal District	336	26.06	33.22	+7.16
Valley of Mexico	293	29.03	35.03	+6.00
Hidalgo	210	25.04	29.09	+3.60
Morelos	271	24.73	27.41	+2.68

		Chemistry		
		Mean(Feb.)	Mean(June)	Gain
Federal District	345	18.28	25.52	+7.24
Valley of Mexico	200	18.92	26.00	+7.08
Hidalgo	217	17.19	22.95	+5.76
Morelos	271	17.53	22.00	+4.47

Table IV-3

Results of Before and After Achievement Testing for *Ensenanza Directa* by State

Area	No. Students	Mathematics		
		Mean(Feb.)	Mean(June)	Gain
Federal District	350	20.78	23.80	+3.02
Valley of Mexico	138	19.38	22.95	+3.12
Hidalgo	144	20.04	22.51	+2.47
Morelos	199	19.35	20.99	+1.64

		Spanish		
		Mean(Feb.)	Mean(June)	Gain
Federal District	340	25.37	28.14	+2.77
Valley of Mexico	115	27.10	28.84	+1.74
Hidalgo	134	21.10	24.28	+3.18
Morelos	192	23.94	26.57	+2.63

		Chemistry		
		Mean(Feb.)	Mean(June)	Gain
Federal District	248	18.41	22.77	+4.36
Valley of Mexico	159	17.08	21.44	+4.36
Hidalgo	107	21.35	27.96	+6.61
Morelos	199	18.16	20.79	+2.63

b. General Ability: Since the three general ability tests were administered only to TS students there can be no direct comparisons between groups. However, some indirect evidence is available to make a tentative conclusion about the TS group results that are seen in Table IV-4. Without a comparison group, it is difficult to judge how well the TS group did as a whole in these tests. When asked about the norms developed for these tests for the technical schools, the chief of the National Center for Educational Guidance, who has overseen the administration of these tests for a number of years, said that the TS results were well below the technical school norms. She thought that students from the ED schools would score higher on general ability than students from the technical or vocational schools and that TS students would be considerably lower than ED students. She further added that the TS average on the Otis test was well below that for 16 and 17 year olds entering Normal Schools outside Mexico City in 1971 (18.41 and 17.71 compared with 8.20 and 8.47 for the equivalent TS sample in Mexico City). The tentative conclusion about the group comparisons would be as follows:

> Result 3: TS students score below the general level expected of ED students and below the recorded levels of technical secondary students.

Two other questions are important in understanding the general ability results for TS students: does the usual state pattern hold for general ability and, secondly, to

Table IV-4

Test Results from the Otis, Analogy and Number Tests for *Telesecundaria* Students, Total and by Geographical Areas

Total Scores for Entire Sample

No. Students	Test	Mean	St. Dev.
978	Otis	14.18	6.12
976	Analogy	6.02	3.12
976	Number	9.79	5.46

General Ability Scores by State

State	No. Students	Test	Mean	St. Deviation
D.F.	246	Otis	15.94	6.69
Valle de Mex.	286	Otis	14.23	5.60
Hidalgo	178	Otis	13.86	5.99
Morelos	268	Otis	12.71	5.77
D.F.	246	Analogy	7.12	2.98
Valle de Mex.	286	Analogy	6.61	3.03
Hidalgo	178	Analogy	5.33	2.94
Morelos	268	Analogy	4.86	2.97
D.F.	246	Number	11.42	6.02
Valle de Mex.	286	Number	9.96	5.09
Hidalgo	178	Number	10.36	5.49
Morelos	268	Number	7.75	4.63

what extent does general ability predict scores on the achievement tests? For the first question, an examination of results by states is found in the lower half of Table IV-4 and strongly confirms patterns found in achievement results. Table IV-5 indicates the extent to which general ability is positively related to achievement in the TS sample. These findings suggest that:

> Result 4: General ability results follow an identical order by state as those of achievement; the more urban the state, the higher the level of general ability. Also, general ability is strongly related to achievement and is one of the single largest factors accounting for the variance in achievement.

Such findings suggest several things: first, the general skills a student brings with him to secondary school strongly influences how well he achieves; secondly, students' abilities vary a great deal from one area to another. In thinking about the expansion of opportunity for secondary schooling to more rural students, decision-makers should realize that expanded opportunity can not mitigate the varying effects of background. Achievement results of this study indicate that many disadvantaged students can learn, but it would be unrealistic to expect students with disadvantages to achieve at the same level as students from more urban areas. This does not mean that poorer students should get inferior instruction but rather that, in order for them to have a more equal opportunity to learn, they need equal or better instruction.

Table IV-5

Pearson Correlations of General Ability and Achievement Tests for Mathematics, Spanish and Chemistry for TS.

General Ability Tests	Mathematics Achievement Scores		
	Before	After	Change
Otis	$.27^3$	$.28^3$	$.09^3$
Analogies	$.29^3$	$.35^3$	$.15^3$
Number skill	$.34^3$	$.41^3$	$.17^3$

	Spanish Achievement Scores		
	Before	After	Change
Otis	$.32^3$	$.30^3$	--
Analogies	$.26^3$	$.26^3$	--
Number skill	$.25^3$	$.27^3$	$.08^2$

	Chemistry Achievement Scores		
	Before	After	Change
Otis	$.24^3$	$.21^3$	--
Analogies	$.22^3$	$.21^3$	--
Number skill	$.28^3$	$.29^3$	$.09^2$

Note: Numbers above the correlations indicate the levels of significance: 1=$p < .05$; 2=$p < .01$; 3=$p < .001$.

c. *Background factors of parents'education, occupation, income*: It was pointed out in Chapter Two, Table II-2, that the *ED* students had better educated parents than did *TS* students. The same was true of fathers' occupations. If ownership of a television set is used an an indirect measure of income level, especially in the three rural states outside of DF, the advantage also lies with the *ED* students (comparisons by state show: Valley of Mexico, 84% vs. 61% families with TV; Hidalgo, 65% vs. 48%; Morelos, 55% vs. 50%).

> *Result 5*: Background factors of parents' education, occupational status of the father and TV ownership all relate significantly and positively to achievement for the *ED* group. For *TS* the pattern does not hold for achievement but only for general ability.

What is striking about this finding is not that students with certain family advantages do better on achievement, but that this pattern did not seem to hold to any degree among the *TS* sample, except for the general ability tests. Such a finding suggests a question to be answered in the analysis of these data: if background factors are positively related to achievement, why did the *ED* group, from more advantaged backgrounds, not do better than the *TS* group on their achievement tests? The apparent answer is that the instructional television of *TS* makes a difference in learning; that a less talented and disadvantaged group given the chance to learn by instructional television and a classroom coordinator can overcome the disadvantage and achieve equally with regular secondary students.

Another question raised by the evidence is whether background factors influenced achievement differentially across the four states, that is, are there different patterns for TS and ED across the different geographic areas? Does background affect achievement differently in more rural or more urban areas? From Table Two in Appendix C, the following summary may be made:

> Result 6: Background factors of parents' education and fathers' occupation seem to affect achievement for ED more in urban than in rural states; for TS, this influence is limited to Mexico City. TV ownership seemed to be related to achievement only for TS in the more rural areas; not at all for ED.

d. Demographic Factors: Age and Sex: One might ask whether age and sex showed significant relationship to achievement in TS and ED samples. In fact, neither factor showed as strong a relationship to achievement as did those mentioned above. With regard to sex differences, however, boys scored higher on the general ability tests, and when sex differences for achievement gain scores were analyzed by state, there was also a small but consistent advantage for TS boys. This advantage was reduced in the more rural states and was not found for ED.

Age is another variable often related to achievement. It is plausible to expect that older students score lower because they are repeaters or returned drop-outs. There was a large difference in the average age of students in the two samples with ED averaging 15.0 years and TS students

16.3 years. Within the two groups, there was greater uniformity of age for TS students across the different states. The spread between the most urban area of DF and most rural of Morelos in TS was only .3 of a year (16.2 vs. 16.5 years), while the same spread in ED was a full year (14.6 in DF vs. 15.6 in Morelos). This seems to indicate that outside large urban centers the average age for regular secondary students increases. TS students were older than ED counterparts in all geographic regions.

One returns to the question of whether the age of students was related to their achievement. Although correlations did not reveal any significant relationships, there did seem to be a consistent pattern. When end of semester achievement scores were examined separately for a young group (14 year olds) and an old group (18 year olds), there was a consistent advantage for the younger students in both TS and ED. This advantage was reduced in rural states where student age seemed to make less difference.

The relationship of age to general ability among those students (TS only) who took the test was significant. Younger students did significantly better on the Otis and the analogies tests than did older students; there was no difference on the number test.

These findings may be summarized as follows (See Table Three, Appendix C):

> Result 7: Although sex and age do not have as strong a relationship to achievement as other factors already examined, some consistency emerges: younger male students tend to do better in both ED and TS and within both groups, age and sex differences on achievement were smaller in the rural areas.

e. Teacher Behavior in the Classroom: The study of classroom behavior of teachers reported elsewhere* gives a partial answer to the question: does the teacher's way of conducting his class make a difference in student learning? The partial answer, for Mathematics at least, seems to be that it does. Observations were made of Spanish and Mathematics classes only (no science) for a subsample of the classes tested in achievement. Since teaching behaviors did not differ significantly in the TS and ED, results were analyzed together. From this analysis, one may summarize as follows:

> Result 8: Teacher behaviors that most prompted active student participation in Mathematics showed a significant relationship with higher achievement for both TS and ED.

In Spanish there were few significant relationships between teacher behavior and achievement. This may be due to several factors; the findings here are not as clear as they are in Mathematics.

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* Judith A. Mayo, The Observation of Telesecundaria and Ensenanza Directa Teachers in Mexico, Institute for Communication Research, Stanford University, 1973.

3. Conclusions on Learning

The learning differences between TS and ED, even though somewhat in favor of TS students, really indicate more or less equal learning on the part of both groups. What makes this finding so important is that despite a generally poorer, more rural and disadvantaged background, TS students do as well as their counterparts in regular secondary schools. Furthermore, the method of instruction of TS is not only less costly but it reaches a predominantly rural audience that would otherwise not have access to secondary schooling at all. How does one explain this finding?

On the basis of three achievement tests, it is not possible to conclude that TS is superior to traditional teaching methods; in fact, most observers of the television lessons are skeptical of their quality. What some people forget, however, is that the television lessons are exposed to public view every day for any citizen to observe and criticize. These lessons are admittedly not as good as they might be, but are they any worse than the average classroom presentation of the regular secondary school teacher? No one can conclusively answer this question at present, but it might be quite revealing if one could observe classroom teaching on a regular and unobtrusive basis. The limited teacher observation study carried out as part of this evaluation showed that the official secondary teachers of ED were about the same as the primary school classroom coordinators of TS in terms of their teaching behavior. This does not argue for the superior quality of the latter, only the relative poor level of both samples. Several conditions help the TS coordinator. He or she generally has a class about half the size of ED classes (class average in TS was 23, in ED, 47). Also, the coordinator remains with the same class all day and personally gets to know his students much better.

Another factor which may help explain the encouraging learning performance of TS students is that this group has no other alternative for school. If rural primary graduates do not get secondary education from television they will probably not get it at all. Thus, the motivation of individual students in TS schools may play an important part in their achievement. There is no direct evidence for this, other than impressionistic evidence gathered from a number of visits to rural schools in the four state area. If motivation is a factor, it is but one consideration for decision-makers to keep in mind as they seek to expand educational opportunities throughout Mexico. There is another caution to be made. Even if disadvantaged rural students can learn from a system of televised instruction, schooling may foster aspirations that cannot be fulfilled. If school engenders desires for more school and better jobs that are simply not available, the high level of motivation may wither and be replaced by a frustration that will hinder rather than help learning.

Aspirations: More Schooling, Better Jobs and Higher Salaries

Students in their final year of secondary are at a crossroads. They are 15 or 16 years old and they must decide whether to look for a job or to continue their studies. This is an important decision for the student, but it is also crucial for the educational planner who must design programs that will not only serve the individual needs of students but the nation as a whole.

In the course of the evaluation, particular attention was paid to what the third year students in the two systems wished to do in the future. A student survey administered in June, 1972, contained a number of measures of educational, career and salary aspirations.

The analysis followed here will parallel that of the achievement section. Aspirations will be considered as outputs and the TS and ED groups will be compared. Within each group, the relationship of aspiration to learning outcomes, state stratification, background and demographic factors will be examined. A profile of high and low aspirers will summarize these findings. In conclusion, the implications of these results for educational decision-makers will be clarified.

1. Comparison between Instructional Groups of TS and ED: Considering aspirations as outputs of the two instructional systems, Table IV-6 compares how much education and what kind of occupations the two groups aspire to. The

results suggest that:

> Result 9: Students of both TS and ED hold high aspirations for more schooling and better jobs, but the proportions of students desiring university level training and professional careers are much higher in the ED group.

Relatively few students from either group wished to terminate their education at the end of secondary (9th grade). Students from TS were particularly attracted to commercial and normal school courses. While these opportunities were also attractive to ED students, the majority aspired to university level schooling. TS students opted mostly for middle level careers (cf. list of careers and their levels at end of questionnaire in Appendix A) such as teachers, secretary or technician of one sort or another, while almost two-thirds of their counterparts in ED looked forward to careers in the traditional professions of medicine, engineering, law or architecture.

The higher aspirations of ED students were also demonstrated in response to a question on the survey that asked students what monthly salary they considered necessary to live decently. Dividing responses into high and low categories (with U.S. $160 serving as a dividing line) 44 percent of ED students were in the high category versus only 28 percent of TS students.

Table IV-6

Educational and Occupational Aspirations of Students of TS and ED

Educational Aspiration

Level of Schooling Desired	(TS) Telesecundaria	(ED) Enseñanza Directa
Finish Secondary	13.8%	4.8%
Finish Normal or Short Vocational/Professional Course	50.5%	35.0%
Finish Preparatoria (Senior High School)	9.4%	6.0%
Finish University or Politechnic Institute	26.3%	53.8%

Occupational Aspirations

General Occupational Level*	(TS) Telesecundaria	(ED) Enseñanza Directa
Lower Level Occupations	9.2%	3.0%
Middle Level Occupations	51.6%	33.1%
Higher/Professional Level Occupations	39.2%	63.9%

* For a list of occupations by level, see the occupational list at the end of the questionnaire, Appendix A.

2. Comparisons within Groups:

a. State, Background and Demographic Factors: Differences across states have strongly marked previous findings. As illustrated in Figure IV-1, similar finding also emerges on aspirations:

> Result 10: Students with high aspirations (for more school, better jobs and higher salaries) were in the DF and Valley of Mexico, while those with lower aspirations were more evident in Hidalgo and Morelos. This was true of both TS and ED.

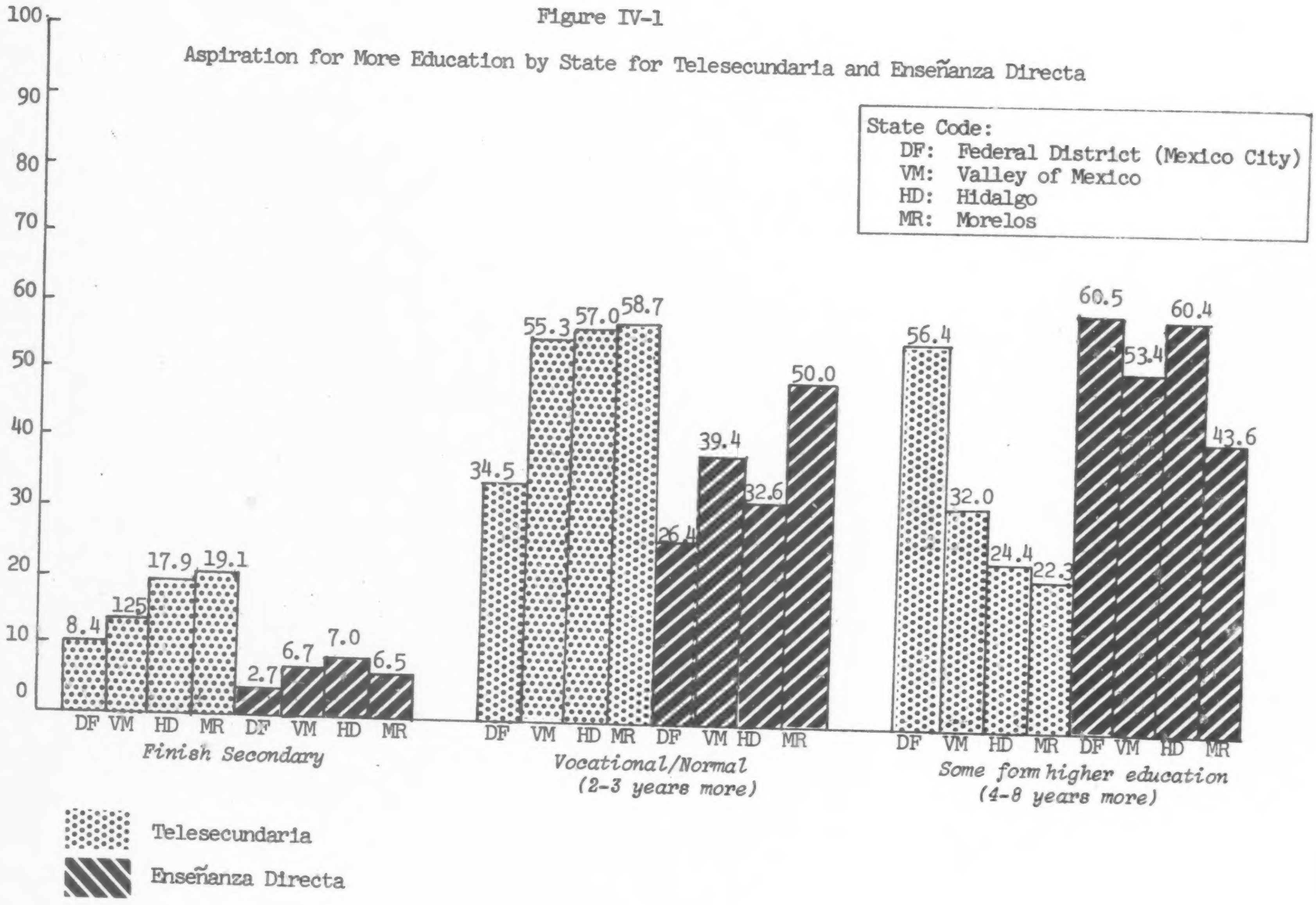
On examination of data in Table IV in Appendix C, one sees that the higher aspiration of ED students can only be partly explained by their more urban environment than TS students. Similar differences in aspiration hold between TS and ED even in the more rural states of Hidalgo and Morelos.

A considerable number of TS students did not plan to go on in school (13.8 percent in Table IV-6), but the pattern was not uniform for each state as the Figure One shows. While 8.4 percent of TS students in Mexico City planned no further education, 19.1 percent of Morelos students had come to the same decision. Other levels of educational aspiration followed a similar pattern. One concludes, then, that whether a student wishes to go on in school and how far he or she intends to go depends not only on the kind of school he or she attends (ED or TS), but also on where one is attending that school.

Background variables are a second area of examination,

Figure IV-1

Aspiration for More Education by State for Telesecundaria and Enseñanza Directa



The four factors of father's and mother's education, father's occupation and TV ownership were all found to be significantly related to aspiration. A glance at Table IV-7 confirms that as with learning, so with aspiration; the more advanced score higher. One may summarize as follows:

> Result 10: Students with more educated parents who have better jobs and have a television set at home aspire to more education, better jobs and higher salaries. This is true for both groups but the relationship is stronger for ED students.

Examination of these relationships state by state revealed that education and occupation are better predictors of student aspiration in the urban more than in the rural states, while ownership of a television set was more closely related to aspirations in the rural areas.

Finally, one must consider whether boys and girls manifest different aspirations, and whether younger students aspire more than older ones. Taking the factor of age first, one finds that age does not seem to make much difference in occupational or salary aspirations, but that older students in both TS and ED had distinctly lower educational aspirations. This relationship seemed somewhat stronger in rural areas of the TS sample, but not in ED. Such a finding might suggest that, although most students in rural areas want more education, older students in rural areas are more likely to need to find work immediately after secondary school. If there are more students who are older in rural areas, this

Table IV-7

Pearson Correlations for Student Aspirations and Background Factors for TS and ED

Telesecundaria (TS)

Background Factors	Educational Asp.	Occupational Asp.	Salary Asp.
Father's Education	$.20^3$	$.14^3$	$.18^3$
Mother's Education	$.16^3$	$.08^2$	$.12^3$
Father's Occupation	$.07^2$	.05	.04
Television Ownership	$.21^3$	$.16^3$	$.17^3$

Ensenanza Directa (ED)

Background Factors	Educational Asp.	Occupational Asp.	Salary Asp.
Father's Education	$.30^3$	$.21^3$	$.39^3$
Mother's Education	$.30^3$	$.17^3$	$.36^3$
Father's Occupation	$.31^3$	$.20^3$	$.35^3$
Television Ownership	$.29^3$	$.18^3$	$.31^3$

Note: Numbers above correlations indicate levels of significance: 1=$p < .05$; 2=$p < .01$; 3=$p < .001$.

may mean that graduates of TS schools especially are apt to look for employment sooner than their counterparts in ED.

The differences in boys' and girls' aspirations are clearly seen (cf. Tables Five and Six in Appendix C). Many more boys in both TS and ED are drawn to advanced education and professional careers. Girls may be attracted to middle level careers for predominantly cultural reasons (e.g.,they are not expected to compete on a professional level with men) or they may simply envision careers as nurses, secretaries and teachers as opposed to lawyers, doctors or architects as inherently more rewarding. The data do not clarify reasons for the different aspiration levels for boys and girls. Although the pattern holds true for both TS and ED, an examination of comparisons of the two girls groups shows that ED girls have much higher aspirations than do girls in TS. (13.5 percent of the latter want to go on to university, while over 40 percent of the ED girls desire this much advanced education).

A state by state analysis shows that rural girls and boys are somewhat more equal in seeking more education but that boys are still higher in their occupational choices. A summary of these findings shows that:

> Result 12: Younger students in both systems aspire for more education, but age is not strongly related to aspirations. On the other hand, boys aspire for much more education, higher status occupations and

higher salaries than do girls in both TS and ED; however, girls in ED aspire for significantly more schooling than do girls in ~~ED~~.TS.

b. *Relationship of Aspirations to Learning*: An input-output model of schooling suggests that input factors like socio-economic background and level of urbanization are related to outputs such as learning, aspirations and attitudes. How output measures are related to one another is a more difficult problem, but important to consider, nevertheless. One can establish a relationship between learning and aspiration without being able to establish a casual relationship or a direction of influence. On the one hand, one could hypothesize that students with high aspirations work harder and therefore achieve better, but it seems equally reasonable to suppose that students who do well on examinations, and in school generally, aspire to continue their education more than others. There is a third possibility that extraneous background or class factors may be related to and influence both variables and that aspiration and learning are not directly related to one another, finally, or that they influence one another mutually.

The relationships between achievement learning and educational, career and salary aspirations can be found in Table Seven in Appendix C. It is clear that higher achievers also aspired for more education, better jobs and higher salaries. This pattern held within both instructional groups.

State by state analysis of the relationships, however, indicate opposite tendencies for TS and ED. (See Table Eight, Appendix C). In urban areas the relation of achievement and aspiration was greater for ED than TS; in rural areas the relation of achievement and aspiration was found more in TS than in ED schools.

The relationship between aspiration and general ability is even stronger than the relationship between aspiration and achievement for the TS group (ED students did not take general ability tests). Table Seven in Appendix C suggests that:

> Result 13: The higher the students' general ability and achievement, the higher tended to be their aspiration for more schooling, better jobs and higher salary. Although aspiration tended to be generally higher among ED students, the strength of the relationship between aspiration/learning was about the same for both groups. This pattern was the strongest for rural TS students.

3. Conclusions: The data on aspirations suggests that 9th grade students have formed a fairly coherent picture of what they want in the future. Many wish to leave the countryside to find advanced educational opportunities in the cities, particularly Mexico City. They seem prepared to make the necessary sacrifices to achieve their objectives.

The pattern of aspirations has a great deal to do with background, state and demographic factors. The more advantaged students of the ED system are repeating the aspirations that have existed in the past when the traditional school system served only an elite population. If one were to project these aspirations onto all secondary students in Mexico, and then look at the consequences for Mexican higher education, the problem would be made dramatically clear. There would be no chance of providing enough universities for students who wish to enter professional careers.

Will the school system be able to stand mounting pressures at higher levels? What will be the consequences of an expansion of secondary opportunities through mechanisms such as the TS system? The increasing number of rural graduates of TS will need employment. Will rural graduates find employment in their own communities or will the television schools simply accelerate the rural exodus and create greater problems than it solves?

The answers to these questions are not easy to predict. One can project enrollment figures and estimate how well future students will be taught, but it is difficult to say whether or not student aspirations will be fulfilled. A follow-up study of a sample of TS graduates was conducted in the Fall of 1972. Results were scattered, but they are reported below in order to begin to piece together an answer to some of the questions that have been posed above.

The Follow-up Study of Telesecundaria Graduates

In the fall of 1972, a follow-up study of the previous June's TS graduates was conducted in the eight state region. The purpose of the study was to determine what recent graduates of the system were doing and to see to what extent their aspirations had been fulfilled. Administrators of the TS system as well as other SEP officials were anxious to have a reliable picture of what educational and career opportunities were available to young people who, had it not been for the extension of secondary school through the TS, would not have been able to continue their education beyond the 6th grade.

Because 9th grade TS coordinators were in the best position to know the whereabouts of their former students, a survey questionnaire was drawn up and distributed to a sample of them throughout the eight state region. Alongside a full listing of the previous year's 9th graders, the coordinators were requested to note whether a particular graduate was 1) enrolled in some educational or training program, 2) employed in some job, 3) unemployed, or 4) if his status could not be determined. In addition, space was provided for the coordinators to specify where in Mexico their former students were studying or working. An effort was made to enhance the coordinators' response rate by asking the state supervisors to oversee the administration of the questionnaires.

Unfortunately, efforts to motivate the coordinators to complete and return the follow-up questionnaires were not very successful. As a result, acceptable response rates were not obtained in most states. All told, 39 coordinators returned the questionnaires, thereby accounting for 777 former TS students or approximately 12 percent of the total number of 1972 graduates. The study did not provide an adequate data base upon which to draw firm conclusions, but it did suggest some trends that merit more detailed investigation in the future.

In the eight state region, 44 percent of the 1972 TS graduates had continued their education, 29 percent were employed, and 27 percent were either idle or could not be accounted for by their former teachers. More boys (47 percent)than girls (40 percent) had continued their studies beyond the 9th grade and the highest proportions of TS graduates going on in school were found in Mexico City and in the states of Mexico and Veracruz.

Among TS graduates who were studying, 29 percent were in programs leading to the university or the advanced Polytechnic Institute while 26 percent were enrolled in terminal technical or vocational schools. The remaining 45 percent of the graduates still in school were divided among teacher training programs (14 percent), commercial courses (13 percent), and a miscellaneous category (18 percent) incorporating a wide variety of specialized courses such as nursing computer programming, and military science.

The majority of TS graduates enrolled in advanced training courses had remained in their home states and their was some evidence to suggest that their choice of school or training program had been determined by the proximity of opportunities close to home. On the other hand, approximately 20 percent of the TS graduates had migrated to Mexico City in order to continue their education.

Information about the 29 percent of TS graduates who were employed at the time of the follow-up study was not so complete. The proportion of boys entering directly into the work force after secondary school was higher than the proportion of girls in all regions. Most of the boys were employed as agricultural or construction laborers and, although a few were working as apprentice tradesmen or salesmen, menial jobs were the rule for this group. Only 22 percent of the girls were known to be working outside their homes and most of this group were employed as sales clerks in their home towns. It was evident even from the incomplete data available on employment that TS graduates who chose to go to work were not finding jobs commensurate with the aspirations they had expressed the previous spring.

Relatively little is known about the career patterns of Mexico's TS graduates yet there have been some 18,000 graduates to date. Without more detailed study of the educational and occupational opportunities open to these young people, a much needed cost-benefit study of the current system cannot be undertaken. As part of the current evaluation of TS' cost-effectiveness, the follow-up study was attempted. The fact that this undertaking was not wholly adequate should not deter future investigations of this kind. Only with more detailed information on job opportunities within the different regions will administrators and planners be able to determine if the TS system is really providing better trained people for the rural areas through the extension of secondary school.

Attitudes: Affective Response to Change in Society

In the past, educational research and evaluation have stressed the cognitive side of schooling effects. Accordingly, a great deal of emphasis has been placed on the development of objective measures of learning and cognitive abilities to the detriment or neglect of measures of the affective development of students. It is clear that school alone does not account for all affective development in children. The family and community remain a strong force in the student's formation. Yet school systems frequently outline general goals such as the training of well rounded persons, good citizens, or socially responsible individuals. These are largely affective goals that concern values, attitudes, and character and go well beyond the cognitive growth or achievement learning so often stressed in student evaluation.

The present evaluation has recognized the importance of this other aspect of students' development, but it has not been able to do more than measure student attitudes toward their society and, in the case of TS students, toward the television instruction system in which they study. It is possible to measure affective growth in many other areas of a student's life and with other methods than the paper and pencil attitude scales used in the present research. However, once again, limitations of time and resources permitted only limited efforts in this area. Both TS and ED students responded to questions seeking information about openness to change and attitudes toward a modern, changing society. These topics are most relevant for students who live in a society which is changing rapidly and for which even greater change, especially in rural areas, is acutely needed.

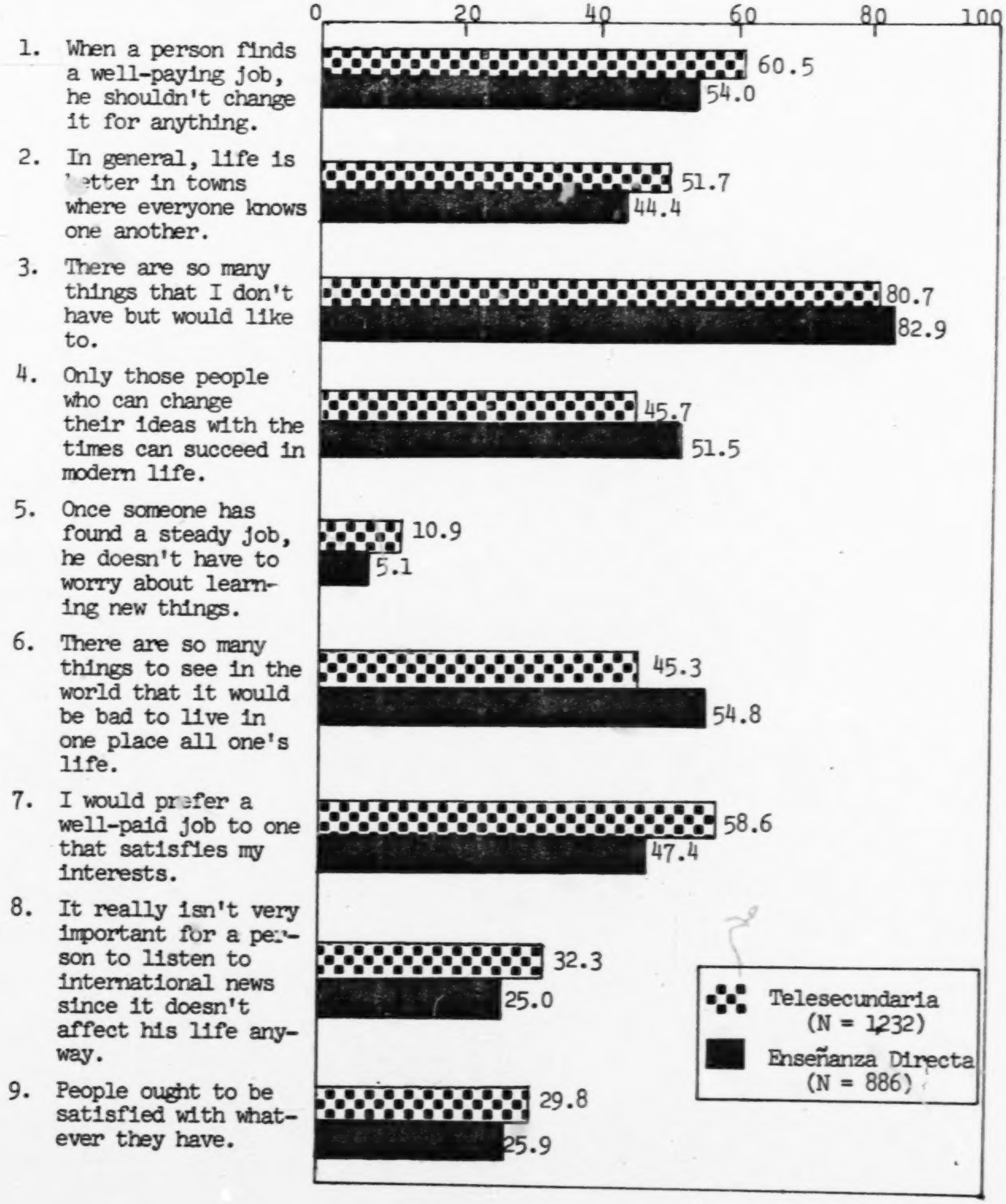
1. Comparison between Instructional Groups of TS and ED: Attitudes may be considered both as outputs of the educational system and as inputs to learning. As outputs, one wants to compare attitudes of the two instructional groups to see if there are large differences between them. When this comparison was made for the nine attitude items for TS and ED (seen graphically in Figure IV-2):

> Result 14: Students of both systems responded in a very similar way in the attitude scales although TS students manifested a slight but consistent tendency to be less change oriented. Such a result may be explained by the generally lower socio-economic level from which they come.

As Figure Two illustrates, there is an almost identical pattern of attitudes for both groups indicating that on this measure the affective development of both groups is very similar. However, if one examines each item of the scale, it appears that the TS students are always slightly more conservative or less change-oriented in their responses. For example, the first item asks how much a well paying job is valued, if it has priority over everything else. The more

Figure IV-2

Comparison of Attitudes of Telesecundaria and Direct Teaching Students. Percentage Agreement with Statements



mobile person might be willing to risk a well paying job, one less oriented to change might not. TS students were 60.5 percent in agreement with the notion that one should not risk such a job on any account, as against only 54.0 percent of the ED students.

Though consistent, such differences between the two samples are slight (never more than 11 percentage points apart). Desire for job security or willingness to stay in a small town may be more reflective of TS students who tend to be from smaller towns and from poorer families than their ED counterparts. These results might also mean that TS students realize they have little or no economic cushion to fall back on and they are thus less willing to take risks.

2. Relationship of Attitudes to Learning: Learning or failure to learn is not just related to a particular method of instruction, but also to the kinds of students that are recruited to go to school, the social structure in which they live, and the individual attitudes that are a product of their backgrounds. In the present case, a more change-oriented response pattern to the nine attitude items in the scale relates positively to achievement learning and, for TS students, to general ability levels. An examination of the data (cf. Table Nine in Appendix C) indicates that there was a consistent and strong relationship between attitudes and learning. The relationships may be summarized as

follows:

> Result 15: Students who respond in more "modern" or change-oriented ways were more likely to score higher on achievement and (for TS only) general ability tests. The relationship between learning and attitudes was stronger among ED students. For TS students, the relationship between "modern" attitudes and general ability was stronger than that between attitudes and achievement, although both were statistically significant.

In sum, a pattern of association, as opposed to a clear casual relationship, exists between student attitudes and learning. The matter needs further investigation to determine whether learning performance produces certain attitudes or vice versa, or whether the variables could be influencing each other mutually, or whether some third factor like background or state residence could be causing both.

3. Relationship of Attitudes with other Factors: What factors are related to student attitudes? Do boys and girls tend to differ in their attitudes about change? Do attitudes vary according to state, family background, or age? A brief examination of these questions completes the study of attitudes as outputs of schooling and gives a more complete picture of the graduates of the two instructional systems.

An examination of the evidence currently available (before a complete analysis has been done) may be seen in Table Ten in Appendix C. Several tentative conclusions can be drawn. First, the state of residence and the characteristics associated with it have a strong relationship with attitudes in both groups. Second, boys and girls did not by and large have different attitudes and age did not seem to make any difference at all in their responses. Third, father's and mother's education did have a significant and positive relationship with student attitudes. Finally, with regard to aspirations, attitudes were strongly related to educational aspiration for both groups and to occupational choice for ED alone.

4. Conclusions on Attitudes: The attitudes that students manifest adds one more piece to the picture that has emerged from the evaluation study. There are a number of input factors that are consistently related to the outputs and these outputs, in turn, have shown a consistent relationship among themselves. What is clear is that student performance on learning and general ability tests, as well as their responses on attitude scales and to questions about their future study and work are neither independent nor random. The more change-oriented, risk-taking, or "modern" the response to attitude items, the better the achievement, the higher the general ability, the greater the level of aspiration, and the more apt the student is to be from a more educated family and an urban state. Obviously, no one individual or group of individuals are exactly matched on these traits, but the analysis has indicated that these factors do relate to one another in a significant way among the students in the

sample. This is the central result that educational decision-makers must keep in mind when they seek to extend educational opportunities to large numbers of primary graduates in Mexico's rural areas.

One might summarize the attitude section with a profile of the more change-oriented student. He is a higher achiever and aspirer than average who comes from a better educated family and a more urban state. His attitudes reflect a willingness to change even a good job to satisfy his interests. He prefers not to live in a small town. He wants many things in life and does not think people should be satisfied with what they have. He believes one may have to be willing to change his ideas and his place of residence to succeed. One is struck by the fact that these attitudes may not be wholly appropriate to the rural student or to the development of Mexico's rural areas. It is this kind of evidence that the decision-maker must consider in spreading educational opportunity. Will more school form attitudes that will help develop rural Mexico or will they simply draw off the most promising human resources to the urban areas?

Opinions about the Telesecundaria System

Although there have been some attempts to get systematic feedback on the TS in the past, the opportunity to find out on a broad scale what students think about their schools was seen as an important input to deciding how TS could be improved and/or expanded. The following section is a summary of what students, the chief clients of the system, think about TS. ED students did not answer this part of the survey questionnaire.

The first part of the inquiry consisted of a set of seven general statements about television teaching. Responses to these items can be seen in Table IV-8. An examination of results shows that:

> Result 16: Student attitudes toward TS are generally favorable, but it remains up to decision-makers to decide what is an acceptable level of response before taking remedial action.

The problem with this kind of feedback is illustrated in the first item. Seventy-five percent of the students say that they can see the television lessons clearly, 19 percent disagree and 6 percent are uncertain. Those who agree constitute a majority to be sure, but when almost 25 percent cannot see the lessons clearly, then a decison-maker must ask whether this is not a major problem. The decision-maker in Mexico City might examine whether unfavorable responses are from a single school or several clusters of schools in well defined areas. If so, there may be a signal problem that has to do with the power of the transmitter signal. If the responses are scattered, it may more likely be local reception problems of antenna or set. However, in either case he cannot do much directly about it as matters

Table IV-8

Reactions of Telesecundaria Students to Statements about the Television System

Attitude/Statements	Response % Agree	Disagree	Not Sure
1. TV classes can be clearly seen.	75.2%	18.9%	5.9%
2. TV classes are difficult.	13.9	68.1	18.0
3. After the TV classes, there is not enough opportunity to ask questions or give opinions.	37.3	57.1	5.6
4. My parents are happy that I have my classes by TV.	79.9	3.7	16.5
5. It seems that classroom teachers like to teach by using TV classes.	74.6	6.3	19.1
6. If I do not understand something during the TV program, I can easily clarify my doubts about it.	81.4	7.8	10.9
7. I would prefer to stay in Telesecundaria even if I had a chance to go to a regular secondary school.	60.8	15.8	23.5

now stand. The transmitter used to broadcast TS lessons is operated at low power because it is donated by Channel 5 and an increase in power is not available at present. Likewise, DGEAD does not provide maintenance for sets or antennas. Given these facts, feedback may not be useful for direct action. This situation illustrates both the difficulty of interpreting feedback of this kind and the structural problems facing the TS system that will be discussed in a later chapter.

The remainder of the items on the scale show rather encouraging results. Only 14 percent of students think classes are difficult. Still, more than a third think that there may not be enough opportunity to ask questions after the TV lesson. This is a curious finding in the light of the teacher observation study that found few questions being asked at all. The TS leaders may want to look further into this anomaly: are few questions asked because there is no time (observation refutes this); is it because the television teacher's approach does not encourage questions; or is it the passive atmosphere in the classroom that stifles curiosity? The decision-maker must provide some ansers to these questions before he can try to correct the problem.

Three-fourths or more of the students agree that their parents and teachers are happy with the television system.

Although more than a third said that there was not enough opportunity to ask questions, over 80 percent agreed that they could clarify doubts that had come up in the TV lesson. Again, the teacher observation study indicates that students rarely try to clarify doubts in class. The problem with even the most carefully worded feedback questionnaire is illustrated here. Without other kinds of evidence from student learning and classroom observation, decision-makers have a difficult time translating the information into realistic actions.

Finally, 60 percent of the students were loyal to their TS schools when asked whether they would leave if given an opportunity to go to a regular secondary. In visits to classes throughout the four states, researchers found this loyalty corroborated by teachers' testimony. Although many observers outside the TS system consider the TS "second class", students in the system defend the quality of their instruction and do not often transfer to regular school. The difference in the response to this question across states was illuminating, however. Students in the Federal District were more inclined to change (21 percent) than the most rural students in Morelos (10 percent).

Another form of feedback was provided by asking students to rate the lesson series they receive via television. Results are presented in Table IV-9. Again, such information

Table IV-9

Student Preferences toward Specific Television Lessons
(TS only)

Television Class	Response %		
	I like it	I am indifferent	I don't like it
Civics	86.5%	10.5%	3.0%
Chemistry	81.7	12.8	5.5
Mathematics	80.5	14.3	4.6
Music	77.4	17.1	5.4
Physical Education	75.5	18.2	6.3
Physics	74.8	16.4	8.8
English	71.2	18.3	10.5
Spanish	63.0	23.4	13.6
History	60.7	28.5	10.8
Technological Activities	53.1	32.2	14.7

needs to be checked against classroom visits and student learning results to be clearly understood and to be useful for corrective actions. The decision-maker might focus his concern on the programs that fell in the lower third of the list and see if there is any other indication of quality problems. Then he can determine what should be done to improve these programs.

This section has illustrated that an evaluation is not simply the gathering of a large amount of information on a given school system or even comparative data from several systems. Once assembled and examined, the basic purpose of an evaluation is still unfulfilled. Decision-makers must see how the conclusions of the study point to realistic actions that can be taken to change and improve the system of instruction.

Chapter V

The Future of Telesecundaria

The TS system, using television in combination with more familiar educational resources such as classroom teachers and textbooks, has enabled Mexico to extend secondary schooling to rural communities whose size and isolation have heretofore prevented the construction of regular schools. At the same time, the TS has provided a second chance for many urban students who, for a variety of scholastic and economic reasons, have not been able to gain admission to regular secondary schools.

On the basis of available evidence, the TS appears to be accomplishing its basic pedogogical objectives. Test results in three subject areas indicate that students taught by television are learning with the same degree of success as their counterparts in the regular secondary schools. While, students in the regular schools have a head start--they come from more privileged backgrounds and are better prepared -- the achievement levels of students in the two systems are quite similar.

When one considers the lower cost of teachers and facilities in the TS (approximately 25 percent lower than regular secondary schooling on a per student basis), the appeal of the TS to cost-conscious educational planners is evident. Cost projections reveal that at higher enrollment levels the TS system would offer even greater savings over the regular secondary school system; the differential in favor of the TS rises with each increase in enrollment. Indeed, on virtually all dimensions of cost that were measured as part of the current evaluation, the TS was found to be more economical than the regular secondary school system.

Two of the most important factors responsible for keeping TS's costs below those of the regular secondary schools are the local initiative and voluntary effort found in the rural communities themselves. To provide schooling for their children, rural parents have formed associations to furnish and maintain practically all of the necessary TS classrooms. Money to purchase the television sets and other materials is customarily raised through charitable efforts or through the organization of community fairs. Such activities encourage local participation and build community spirit which, in turn, nourish the television schools and the community as a whole. The qualities of individual sacrifice and community self-reliance that are so necessary to the operation of the TS system may be, in themselves, the most lasting rewards of the system.

Evidence of the TS's growing popularity is found in the increasing number of communities which have expressed an interest in joining the system. Most have been turned down because the Federal government was not able to provide enough primary teachers to serve as television coordinators.

TS's problems go beyond an inability to have more primary school teachers assigned as coordinators, however. Within the SEP, there is an ambivalent attitude toward the system and its contribution to secondary education. On the one hand, TS is viewed as a useful mechanism for extending educational opportunity. Under current budget restrictions, planners realize that regular secondary schools cannot be constructed in the rural communities typically served by a TS school. On the other hand, there is a deep concern within the SEP and elsewhere about the quality of instruction currently offered by the TS. Critics cite TS's lower admission standards, its less specialized classroom teachers, its irregular and cumbersome administrative procedures, and particularly its televised lessons, as evidence that the system is a poor substitute for regular teaching and therefore not worthy of continued support. While many of the specific criticisms are justified, they are also based as much on the origins of the TS and the system's relationship to the educational bureaucracy as upon some objective evaluation.

The founders of the TS were anxious to establish an independent identity for the system. Although they had received the tacit approval of top SEP officials, many other levels of the education bureaucracy were bypassed in the effort to set up what amounted to a semi-autonoumous administrative apparatus within DGEAD. Such separatism bred resentment toward the TS and eventually led to much tighter control of it by SEP authorities. In recent years, the TS has paid the price for its early autonomy and assertiveness. Strict administrative controls have been placed on the system and all procedures concerning student promotion are reviewed closely by SEP officials. The time consuming review of all students' grades by the division of secondary education within the SEP coupled with DGEAD's inability to process student exams on schedule have prevented many TS students from receiving their diplomas on time, thereby delaying for months their registration in advanced academic programs.

The new director of DGEAD has taken stock of the numerous administrative tasks currently draining the energies of TS personnel and has sought to transfer many of them back to appropriate offices within the SEP. It is her belief that DGEAD should function solely as a production facility with responsibility for only the television lessons and the printed materials that accompany them. Under her plan, responsibility for assigning teachers and supervising the activities of local *teleaulas* would be returned to other offices in the SEP. It remains to be seen whether authority for many aspects of the system can be successfully transferred back to officials who, up until now, have had misgivings about TS's role in Mexican education.

Whether or not DGEAD is successful in its effort to relinquish control over some important aspects of the TS, a reassessment of the system's strengths and weaknesses is needed in order to pinpoint areas for corrective action. The present evaluation was only a first step in that direction. More research is needed to guide decision-making. To help determine the direction of future research, this study will conclude by outlining some of the more promising short and long range alternatives open to TS's leaders.

Short Range Alternatives for the Development of TS

Televison Production. Many of the SEP's misgivings about the TS stem from unfavorable reactions to the televised lessons. Observers from the SEP and DGEAD as well as many private viewers have expressed displeasure at what they see as an unprofessional and unimaginative use of television. Much of the criticism has been fueled by periodic attacks in the Mexican press. Measures to review program quality and production procedures have been taken in recent months and much needed technical assistance has recently been obtained from within Mexico and abroad.

Better use needs to be made of DGEAD's large stock of video-tape. The vast majority of telelessons are currently produced and transmitted live. This custom strains studio facilities and does not permit the television teachers sufficient time to rehearse their programs or to enrich them with appropriate visual aids. With video-tape to prerecord lessons and to permit their rebroadcast in subsequent years, the teleteachers would be able to spend more time upgrading the quality of each individual lesson. Additional care in preparation would thus upgrade the quality of the programs and, ultimately, improve TS' stature in the eyes of the public.

Two methods for estimating the costs of video-tape production for the TS are presented in Appendix D. Both methods assume that three years would be needed for the intitial taping of all subjects in the three secondary grades and that 20 percent of programming would be retaped every year. The primary aim of Method I would be to reduce the costs of production. Video-taping would add approximately $5,600 to the production budget in the first year, but total production costs would be expected to decline by 70 percent within four years. Under this method, the quality of programming would also be expected to improve as the lessons would be retaped gradually over a five year period.

Under Method II, the cost of technical assistance is added to the component costs outlined in Method I (see Appendix D). It is assumed that the annual cost for technical assistance would be equal to the present teleteacher costs in the first three years and 20 percent of that amount in subsequent years. The additional money could be used to hire skilled teaching and production advisors who would concentrate on one grade at a time over the initial three year period.

Production costs would also decrease substantially after a few years under Method II. Although video-taping would add approximately $109,600 to the production budget in the first year, by the fourth year when less studio space and equipment would be needed, production costs would be expected to decline by 60 percent. Thus, while taped production would add the relatively high cost of video-tape to the TS system, such an expenditure would be more than offset by lower annual production costs after the first few years.

Transmission. In the short run, it is reasonable for TS to continue using the donated transmission facilities of Channel 5. However, it appears that Channel 5 uses reduced transmission power for its TS broadcasts, resulting in a somewhat smaller broadcast area than is potentially possible and a lower quality signal at the fringes of the reception area. Although no precise information is available on the potential coverage area lost due to the reduced power operation, it would not be difficult to determine by comparing the reception of TS and commercial programs in outlying areas. If this problem warrants correction, it would not be very expensive to pay Channel 5 the extra money necessary to operate at full power.

Enrollment. If TS continues to operate only in the eight state region, there are two strategies it might consider to increase enrollment and thereby reduce the unfulfilled demand for secondary schooling. The first strategy would be to increase enrollment within existing *teleaulas*, while the second strategy would involve the formation of new *teleaulas*.

Increased enrollments within existing *teleaulas* could be accomplished by simply encouraging more students to enter the system. The marginal cost of adding a student to an existing class is very low - - approximately $26. Furthermore, with larger classes, TS's unit costs (average cost per student) would decrease substantially as teacher, facility, and television costs are spread among more students. For example, if TS's present enrollment of 30,000 were to double to 60,000, the average annual cost per student would drop from its present level of $151 to $84. Of course, the pedagogical effects of increasing class sizes would have to be carefully evaluated, but starting with the present average class size of 23 students, it is likely that large increases could be made with little, if any, effect on learning.*

There would, however, be some difficultly in increasing class sizes within the TS system, partly because many of the communities are quite small and partly because of the expense involved in attending secondary school. The average annual family cost of $20 per student for TS is a deterrent to poor families, particularly those with many children. It has been noted in Chapter II that the TS system costs families and localities more, both in absolute and relative terms, than does the ED. This situation plus the fact that TS students come from poorer rural families suggests that a strong case could be made for subsidizing TS students in the future. At a minimum, this might include having SEP pay for the students' books, supplies and uniforms. Such a policy would spur higher enrollments and contribute to a more efficient utilization of TS resources. Remembering the Mexican government's commitment to rural education and the relatively low cost of the TS in comparison to the ED, a subsidy of TS students is an alternative worth serious consideration.

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* In a multitude of studies carried out in many different countries over the past 50 years, differences in class size have had no significant effect on student learning.

A second method for increasing TS enrollment in the short run would be to encourage the formation of new *teleaulas*. Each year, requests by communities to begin a *teleaula* are turned down because of a shortage of primary school teachers. The shortage does not seem to stem from a lack of qualified teaching personnel, but rather from a shortage of funds allocated by SEP to hire additional TS coordinators. Again, considering the commitment of the Mexican government to rural education, this situation would appear to merit review.

Classroom Teaching. The study of classroom teaching behavior in the TS and ED revealed that instructors in both systems used quite similar techniques. The typical teacher in both systems dominated his or her classroom, leaving little time for student participation. At the same time, an analysis of learning results showed that when teachers lectured less and used more "modern" teaching techniques such as group work and supervised student projects, their students achieved more. Above all, the study showed that there was considerable room for improvement in the coordinators teaching styles. How might this be achieved?

The fact that the teacher observation study discovered a positive relationship between student learning and the amount of general education obtained by the TS coordinator suggests that the scholastic attainments of prospective coordinators should be weighted heavily in their selection. Furthermore, coordinators now in service should be encouraged to continue their education. This process might be facilitated were DGEAD to offer scholarships for coordinators to continue their studies on a part-time basis.

The teacher observation study also pointed out the need for more in-service training of the TS coordinators. Taking into account that certain teacher activities were related to higher student learning, the in-service training might include practical instruction in:

(1) the organization and supervision of individual work;

(2) the organization and supervision of group work;

(3) the better use of textbooks, visual aids, and reference materials; and

(4) the encouragement of student participation in the form of exposition, questions, and discussion.

In-service training should be considered a permanent, on-going activity. Instead of trying to prepare teachers in all the above pedagogical fields simultaneously, it might be more effective to treat one at a time. For example, one subject area could be selected in which the coordinators would try to perfect their skills in using visual aids or reference materials more effectively. In this fashion, the in-service training of TS coordinators might best be conceived of as a series of mini-courses punctuated by practice in the classroom.

Television could serve as a convenient means for presenting many of these mini-courses, provided coordinators could be organized in small groups to receive and practice a given teaching technique. Experience from other countries suggests that such courses have much greater impact (1) when teachers can be organized in groups and directed by persons with some previous experience (such as state supervisors) and (2) when the broadcasts are followed by periods of discussion and practice.

Supervision. No position is more important to the day-to-day operation of the TS than that of state supervisor. State supervisors not only forge and maintain links with the local communities served by the TS, they also oversee the work of the classroom coordinators and provide feedback to the teleteachers as well as DGEAD administrators. The successful state supervisor must be a jack of all trades and a talented politician. The TS has been fortunate in its recruitment of such people and these individuals have, in turn, helped keep the system going, often under very trying circumstances.

Despite the talents of the present corps of state supervisors, much more supervisory effort will be needed if the TS is to implement the kinds of policies suggested above. The role of the supervisor will also have to change markedly to incorporate many new responsibilities such as evaluation, the organization of regional in-service training courses, and the monitoring of classroom teaching practices throughout the system. Furthermore, current problems of television reception as well as the delays and shortages in the distribution of guides and other learning materials must be corrected by the supervisors and their superiors in DGEAD if the TS is to function effectively.

Feedback and Evaluation. The reforms and short range policy options suggested in the preceding sections of this chapter would best be implemented with the help of continuing feedback and evaluation. Only with a steady flow of information on costs, learning, and opinion will decision-makers be able to determine whether or not their policies are successful. A competent evaluation unit now exists within DGEAD for this purpose and it should be encouraged to develop research priorities and then to carry out the appropriate studies.

Steps should also be taken to insure that the results of all evaluation activities get as wide a circulation as possible, both within the TS system and elsewhere. Dissemination of research results along with their interpretation should help to correct the impression that evaluation studies have no practical value and belong only on decision-makers' bookshelves. It is particularly important that results be made available to TS coordinators and state supervisors to guide their actions and to counter the widespread fear that evaluations serve only a punitive purpose. A full airing of research procedures and findings would ultimately strengthen the view that evaluation is a vital tool with which to improve all aspects of an instructional system.

Long Range Alternatives for the Development of TS

Transmission and Coverage. There are a number of long range cost alternatives for the transmission of TS programs depending on whether or not the system continues to be confined to its present eight state region. If the present broadcast area is maintained, there are three main possibilities; transmission facilities could continue to be donated, they could be leased, or they could be constructed by the government.

If transmission time continues to be donated by Channel 5, the costs would equal those calculated in Chapter II.

If transmission time were leased from Channel 5 at 75 percent of its minimum rate of $424 per hour,* the total cost (for 33 hours of programming per week, 40 weeks per year) would be approximately $424,000 annually. Although such a sum would add substantially to the fixed costs of the system, with more than 14,000 students in the system, TS's average cost per student would still be less than that for ED.

Channel 5 estimates that it would cost approximately $2,112,000 to construct new transmission facilities capable of serving TS's eight state region. Looking at the cost in another way, TS would have to spend approximately $248,000 per year to have its own transmission facilities** If 10 percent of the annual cost is added for operating expenses, the total annual cost of construction comes quite close to the rental costs cited above. Furthermore, the government would be getting more for its money by building its own facilities since other programs could be broadcast in addition to TS.

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* Given that no commercial programming is broadcast during daytime hours and that the Mexican government would be the purchaser, a 25 percent discount does not seem unreasonable.

** This estimate reflects a 10 percent social rate of discount and a 20 year life (cf. Appendix B).

If the decision is made to extend TS coverage to the entire country, the same three alternatives exist - transmission facilities could either be donated, leased, constructed. The only national network, Channel 2,* has excess capacity during the daytime and thus might be amenable to donating the needed transmission time to TS.

If transmission time were leased from Channel 2 at 75 percent of its minimum rate of $2,592 per hour, the total annual cost for national coverage would be approximately $2,568,000. Assuming higher component costs for an expanded TS system operating in a national environment and assuming the addition of such a large leasing fee, the average student cost (as well as the total system cost) of TS would still be below that of ED, provided that TS enrolled at least 50,000 students.

Butman (1972) estimates the cost of constructing a transmission network to be approximately $35 per square mile under optimal conditions. Considering this estimate and the fact that Mexico's area is about 767,000 square miles, the total transmission facility cost for a system covering the whole country would be approximately $26,848,000.** In annual terms, this would amount to $3,152,000. Without adding the annual cost of operating the system, this amount would still be greater than the rental charge for Channel 2 estimated above. Given the fact that some government transmission facilities already exist, the cost might be lowered somewhat. Government ownership would also permit the broadcasting of other programming besides TS.

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* Channel 2 personnel estimate that 80 percent of the Mexican population lives within the geographical area covered by their signal.

** The cost of satellite transmission was not considered in this analysis due to the present low feasibility of such a project in Mexico. Work is already underway to expand the coverage of the government's ground transmission network. However, in the not too distant future, a satellite system might become more desirable as total coverage and/or multi-channel capability are required.

It is difficult to predict what TS's future will be. At issue is whether or not to continue TS and, if the system is continued, whether to conceive of it only as a means for extending secondary schooling to areas not served by the regular school system or to let it serve urban areas as well. The latter policy would put TS into more direct competition with ED.

If TS were ever to be seriously considered as a complete replacement for ED, a large cost savings could ensue. Given an enrollment of a million students and nationwide coverage, TS's highest probable cost per student would be $143, a 30 percent saving over ED. Of course, in addition to cost, there are many other considerations that would enter into such a decision. One crucial consideration is that if the TS system is to remain less expensive than ED, instructors at the secondary level would have to receive the lower salaries currently paid to primary school teachers. Some adjustment could probably be made over time, but such a policy would be strongly resisted by the teachers' union and would inevitably engender harsh political opposition.

Nonformal Education. An alternative way to use television to extend secondary education in Mexico might be to reduce TS's ties to the formal school system and to adopt a less restrictive policy with regard to admission and accreditation. With a modified secondary curriculum emphasizing basic subjects such as mathematics and Spanish and with an effective means for supplying students with the necessary textbooks, televised lessons could be broadcast directly to students in their homes or community centers. Students' progress in such a system could be monitored by means of regional consulting centers manned by qualified teachers or by having students periodically mail in samples of their work for correction and evaluation. Such an open instructional system could be tied to a much less formal promotion procedure wherein students would simply present themselves at the appropriate time for examinations that would be the basis for awarding secondary diplomas.

In other countries, television and radio systems exhibiting many of the characteristics outlined have been successful because (1) they have proven to be more flexible than traditional schools, (2) they have been able to increase educational opportunity for adults who cannot attend school but who are able to follow televised courses in their homes, and (3) they are far less costly than alternative methods for extending the school. For these reasons and because the demand for secondary schooling in Mexico is now increasing faster than the government's ability to provide either regular schools or teleaulas, a nonformal approach would seem to merit serious consideration.

Although such a nonformal approach to TS could serve a much larger audience, a cautionary note must be added. A great deal of money could be saved in any educational budget by reducing the number of classroom teachers, but without some structure in the learning environment, a majority of students will probably not finish their studies. A number of countries have developed open educational systems at the secondary level, but only the Japanese correspondence high schools have managed to graduate more than 30 percent of their original entrants. Other systems have had much poorer results. Decision-makers will have to decide what is the purpose of increasing educational opportunity in the first place. If it is to insure that as many interested people as possible finish secondary school, some form of organized learning will have to be added to the television system. Without some teachers to guide and motivate students, an open TS system could not be expected to provide a full secondary education for more than 20 to 25 percent of its original students.

As DGEAD's leaders have discovered, many obstacles must be overcome in setting up an instructional television project such as TS. The problems of developing an out-of-school system would probably be greater still. New administrative arrangements might have to be created to insure that students studying on their own with television would really learn and the financial aspects of such an undertaking would have to be carefully analyzed. Above all, educational planners would have to decide whether the broad extension of educational opportunity at the secondary level could be accomplished outside of schools and whether or not such a policy would really be in the best interests of Mexico's development.

Many countries are discovering that the extension of educational opportunity, with or without television, will not insure the kind of balanced development they seek. The analysis of student aspirations in the TS study revealed that young people are anxious to obtain secondary degrees so that they can leave the countryside. There is also a dearth of good job opportunities in the rural areas, while the cities offer the possibility of more education and diverse professional careers. These facts encourage the exodus of many talented people from Mexico's small towns and ejidos, leaving rural areas relatively worse off vis-a-vis the country's metropolitan centers. As long as the Mexican school system stimulates urban migration and fails to replenish the rural areas with well-trained graduates committed to change and innovation, its impact on the nation's development is likely to remain one-sided.

Mexico's TS has proven to be a highly cost-effective system for extending educational opportunity; however, it does not seem to be closing the economic or social gaps between urban and rural students. Rural students continue to perform less well in learning, reflecting their poorer backgrounds and lack of adequate preparation. This pattern is likely to continue unless a new approach to rural education can be developed.

APPENDICES

Appendix A

STUDENT QUESTIONNAIRE

Student: ____
Paternal Name Maternal Name First Name

School: ____
School Name School Number (Key)

Home Address: ____
Street Number Postal Zone

____
Town Municipality State

INSTRUCTIONS: THIS IS NOT A TEST, IT IS A QUESTIONNAIRE. THERE ARE NO CORRECT OR INCORRECT ANSWERS; WHAT MATTERS IS YOUR OPINION, SO ANSWER SINCERELY.

Each of the following questions has one or more answers. Make an "X" on the blank spaces that correspond to the answers you select. When you have to complete information that is requested write on the space provided. Answer ALL questions. There is no time limit, but don't spend too much time on any one question.

GENERAL INFORMATION SECTION

1. Age: ________

2. Sex: ________ Female

________ Male

3. Date of Birth: ______________________________
Day Month Year

4. Of the following people, which live in your house?

________ mother

________ father

4. (continued)

________ brothers or sisters

________ grandparents

________ other relatives

________ others who are not relatives

5. Write the total number of people that live in your house (including yourself):

________ total number of people

6. What kind of work does your father do? ____________________

7. What kind of work does your mother do? ____________________

8. Indicate the highest level of schooling attained by your parents:

A. Your Father		B. Your Mother	
Never went to school	_____	Never went to school	_____
Studied part of primary	_____	Studied part of primary	_____
Completed primary school	_____	Completed primary school	_____
Junior high school	_____	Junior high school	_____
Commercial school	_____	Commercial school	_____
Academic high school	_____	Academic high school	_____
University	_____	University	_____
Don't know	_____	Don't know	_____

9. How much time does it take you to get to school each day?

________ less than 15 minutes

________ between 15 and 30 minutes

________ between 30 minutes and one hour

________ more than one hour

10. Do you work as well as attend school? (Mark only one answer: the one that matches the activity that occupies most of your time after school.)

_________ work for pay outside my household

_________ work with my parents or other relatives and am paid

_________ work only on household chores

_________ I don't work

11. If you work for pay, about how much do you earn each month?

_________ pesos

SECTION II

12. Which of the following media do you have at home? (Make an "X" alongside those which you have at home).

_________ newspapers

_________ magazines

_________ radio

_________ television

_________ books

13. About how much time do you listen to the radio each day?

_________ never

_________ less than one hour each day

_________ 1 or 2 hours each day

_________ 3 or 4 hours each day

_________ more than 4 hours each day

14. How often did you read newspapers last week?

________ never

________ 1 or 2 times

________ 3 or 4 times

________ 5 or 6 times

________ every day

15. How many books did you read last year? (Do NOT include comic books and school textbooks).

________ none

________ one book

________ about 2 or 3

________ between 4 and 10

________ more than 10

16. How often did you go to the movies last month?

________ never

________ once or twice

________ 3 or 4 times

________ more than 4 times

17. Outside of school, how many times did you watch television last week?

________ never

________ once or twice

________ 3 or 4 times

________ 5 or 6 times

________ every day

SECTION III

18. What is your favorite subject in school? ______________________

19. What is your LEAST favorite subject in school? ________________

20. How far do you want to go in school?

_____ Finish only Secondary School

_____ Finish Teachers College or a Commercial Course after Secondary

_____ Finish Academic High School (Preparatory School)

_____ Finish the University or Polytechnical School

_____ Specialize as a graduate student of the University or the Polytechnical School

21. How sure are you that you will finish the studies you hope to complete?

_____ I am certain I will not finish

_____ I believe I will not finish

_____ I may finish

_____ I believe I will finish

_____ I am certain I will finish

22. Would you be willing to move away from your family in order to continue your education in the future?

_____ yes

_____ no

23. What career would you like to enter when you finish your studies?

____

24. What is your main reason for selecting this career?

____

25. If for some reason you are unable to have the career you selected in Question 23, what kind of work will you probably do?

____

26. What do your parents think about your plans for the future?

______ they are in complete agreement with me

______ they are more or less in agreement with me

______ they are more or less in disagreement with me

______ they are in complete disagreement with me

______ I don't know what my parents think

27. In general, what kind of job would you prefer in the future?

______ a secure job, but one without the opportunity to advance

______ a job with a good opportunity for advancement, but secure

28. If at the end of Plan Basico you were to be offered a good paying job but one that would not permit you to continue your studies, would you take the job?

______ Yes

______ No

______ Don't know

29. What monthly salary do you believe is necessary to live decently?

______ from 500 to 1000 pesos (1 peso equals $.08 U.S)

______ from 1,000 to 1,500 pesos

______ from 1,500 to 2,000 pesos

______ from 2,000 to 2,500 pesos

______ more than 2,500 pesos

30. When you finish your studies, would you be willing to live and work in a small town?

______ completely willing

______ more or less willing

______ more or less unwilling

______ completely unwilling

31. When you finish your studies and begin to work, where would you like to live?

______ in the countryside

______ in a small town

______ in a city other than the capital

______ Mexico City

32. When you finish your studies, with whom would you like to work?

______ the government

______ a large company

______ a small company

______ on my own

______ with someone in my family

SECTION IV

In this section you will find a series of statements. There are five possible responses to each statement, which run from "Completely Agree" to "Completely Disagree." You should choose the response closest to your personal opinion and make an "X" above the corresponding line. Example:

PLAYING WITH A BALL IS LOTS OF FUN.

X				
Completely Agree	Agree	Not Sure	Disagree	Completely Disagree

33. WHEN A PERSON FINDS A WELL-PAYING JOB, HE SHOULDN'T CHANGE FOR ANY REASON.

Completely Agree　Agree　Not Sure　Disagree　Completely Disagree

34. IN GENERAL, LIFE IS BEST IN SMALL TOWNS WHERE A PERSON KNOWS EVERYONE.

Completely Agree　Agree　Not Sure　Disagree　Completely Disagree

35. THERE ARE SO MANY THINGS I DON'T HAVE THAT I WOULD LIKE TO HAVE.

Completely Agree　Agree　Not Sure　Disagree　Completely Disagree

36. ONLY THOSE PEOPLE WHO CAN CHANGE THEIR IDEAS AS THE TIMES CHANGE CAN BE SUCCESSFUL IN THE MODERN WORLD.

Completely Agree　Agree　Not Sure　Disagree　Completely Disagree

37. WHEN A PERSON HAS FOUND A SECURE JOB, HE NO LONGER HAS TO WORRY ABOUT LEARNING NEW THINGS.

Completely Agree　Agree　Not Sure　Disagree　Completely Disagree

38. THERE IS SO MUCH TO DO IN THE WORLD THAT IT WOULD BE BAD TO LIVE ONLY IN ONE PLACE THROUGHOUT ONE'S LIFETIME.

Completely Agree	Agree	Not Sure	Disagree	Completely Disagree

39. I PREFER TO HAVE A WELL-PAYING JOB TO ONE THAT FULFILLS MY PERSONAL INTERESTS.

Completely Agree	Agree	Not Sure	Disagree	Completely Disagree

40. IT REALLY ISN'T IMPORTANT FOR A PERSON TO KNOW INTERNATIONAL NEWS, SINCE IT DOESN'T AFFECT ONE'S LIFE.

Completely Agree	Agree	Not Sure	Disagree	Completely Disagree

41. PEOPLE SHOULD BE SATISFIED WITH WHAT THEY HAVE.

Completely Agree	Agree	Not Sure	Disagree	Completely Disagree

SECTION V: TELESECUNDARIA (Answer these statements in the same way you did the previous section).

42. THE PICTURE-QUALITY ON TELEVISION IS GOOD.

Completely Agree	Agree	Not Sure	Disagree	Completely Disagree

43. CLASSES WITH TELEVISION ARE DIFFICULT.

Completely Agree	Agree	Not Sure	Disagree	Completely Disagree

44. THERE IS NOT SUFFICIENT TIME TO ASK QUESTIONS OR OFFER OPINIONS AFTER THE TELEVISION CLASSES.

Completely Agree	Agree	Not Sure	Disagree	Completely Disagree

45. MY PARENTS LIKE THE FACT THAT I RECEIVE TELEVISION IN MY SCHOOL.

Completely Agree   Agree   Not Sure   Disagree   Completely Disagree

46. IT SEEMS THAT CLASSROOM COORDINATORS PREFER TO TEACH WITH TELEVISION.

Completely Agree   Agree   Not Sure   Disagree   Completely Disagree

47. IT IS EASY TO CLARIFY DOUBTS IF I DON'T UNDERSTAND SOMETHING ON TELEVISION.

Completely Agree   Agree   Not Sure   Disagree   Completely Disagree

48. I WOULD PREFER TO STAY IN TELESECUNDARIA EVEN IF I HAD THE CHANCE TO GO TO A REGULAR SECONDARY SCHOOL.

Completely Agree   Agree   Not Sure   Disagree   Completely Disagree

SECTION VI: THE TELELESSONS

Instructions: Answer the following questions by marking an "X" next to the statement that is closest to your own opinion.

49. What do you think about the telelessons in Mathematics?

______ I like them

______ I neither like nor dislike them

______ I do not like them

50. What do you think about the telelessons in Spanish?

______ I like them

______ I neither like nor dislike them

______ I do not like them

51. What do you think about the telelessons in Physics?

______ I like them

______ I neither like nor dislike them

______ I do not like them

52. What do you think about the telelessons in English?

______ I like them

______ I neither like nor dislike them

______ I do not like them

53. What do you think about the telelessons in Chemistry?

______ I like them

______ I neither like nor dislike them

______ I do not like them

54. What do you think about the telelessons in Current Events?

______ I like them

______ I neither like nor dislike them

______ I do not like them

55. What do you think about the telelessons in Vocational Activities?

______ I like them

______ I neither like nor dislike them

______ I do not like them

56. What do you think about the telelessons in Civics?

______ I like them

______ I neither like nor dislike them

______ I do not like them

57. What do you think about the telelessons in Physical Education?

______ I like them

______ I neither like nor dislike them

______ I do not like them

58. What do you think about the telelessons in Music Education?

______ I like them

______ I neither like nor dislike them

______ I do not like them

List of Occupations

01	unemployed
02	retired
03	self-employed

Level 1

10	bricklayer
11	farmer
12	driver
13	merchant
14	beautician
15	industrial worker
16	photographer
17	day laborer
18	policeman or soldier
19	mechanic
20	tradesman
21	machinist
22	tailor
23	servant
24	telephone operator
25	waiter
26	other occupations

Level 2

31	salesman
32	accountant
33	graphic artist
34	practical nurse
35	social worker
36	keypuncher
37	teacher
38	military officer
39	newspaperman
40	pilot
41	radio technician
42	secretary
43	technician
44	extension agent
45	medical technician
46	master mechanic
47	other occupations

Level 3

71	lawyer
72	agronomist
73	architect
74	biologist
75	dentist
76	diplomat
77	economist
78	civil engineer
79	professional nurse
80	pharmacologist
81	physicist, mathematician
82	business manager
83	musician or artist
84	oceanographer
85	psychologist
86	chemist
87	sociologist
88	veterinarian
89	engineer
90	professor or secondary school teacher
91	doctor
92	high-ranking military or police officer
93	other professions

Appendix B

Notes on Cost Estimates and Comparisons

SECTION A: BASIS FOR COST CALCULATIONS FOR ENSEÑANZA DIRECTA-1972

Cost Components	Basis
Administration	The administration costs per student of the ED system are assumed to be 54% of teacher costs as was the case for the last five year period on which such data is available, 1961-1965. The source is the report by the Mexican Comision Nacional de Planeamiento Integral de la Educacio (CNPIE).
Classroom Teachers	A full-time teacher equivalent (there are few full-time teachers) is assumed to work 39 hours per week for an average monthly salary of $390. With an average class size of 50, an annual teacher cost per student of $94 can be computed.
Facilities	An untitled Federal District report that estimates public expenditures for September 1968 to August 1969 showed a cost per equipped secondary school classroom of $18,880. This was annualized over a 20 year period and spread over an average class size and average

Cost Components (continued)	Basis
	classroom utilization rate of 1.5 (i.e., half the schools were on double session).
Student Costs	The costs of books and notebooks were estimated at $24 per year, and the cost per uniform at $4 per year.

SECTION B: BASIS FOR COST CALCULATIONS FOR TELESECUNDARIA-1972

Traditional Components	Basis
Administration	The total administrative cost of TS for 1972 was $168,000. Administrative costs are assumed to vary with the number of students in the system. Given there were approximately 29,000 students in the system in 1972, an annual administrative cost per student of $5.60 can be computed.
Classroom Teachers*	Assuming a full-time teacher earns $168 per month and have an average class size of 23, an annual teacher cost per student of $88 can be computed.

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* In 1972 there was a raise of primary school teacher salaries of $16 per month which caused TS unit costs to increase by about 10 percent. However, secondary school teacher salaries are expected to be raised soon and this action will maintain the cost per student advantage of TS.

Traditional Components (continued)	Basis
Facilities	Survey data showed an average construction cost of $4,160 per classroom and annual rental of $192 per classroom per year, assuming a twenty year life and that half the classrooms are constructed and half are rented (actually this overstates the cost because less than half are constructed and many are donated). Average class size is again 23 students from which an annualized cost of $11.92 per student per year can be computed. Because of the aforementioned overstatement, it is assumed that this figure includes maintenance.
Student Costs	The average cost of books is less for the TS system ($16) than for ED. Adding a $4 cost per uniform per year yields an estimate of $20 per student per year for this category.

ETV Component	Basis
Production Personnel and Administration	The cost for 1972 as estimated by DGEAD personnel was $220,000.
Teleteachers	Teachers are paid on an hourly basis at $10.40 per week-hour per month and receive 7 hours teaching credit for each program they teach.

ETV Component(continued)	Basis
	Given that about 100 programs are produced each week over a 38 week school year and that DGEAD adds about $16,000 annually in bonus pay, a yearly cost of $104,000 can be calculated for the teleteacher.
Studios	There are four studios build at a cost of about $32,000 per studio, and their cost is annualized over a twenty year life to arrive at an estimate of $15,200 per year.
Studio Equipment	The total cost of existing studio equipment was computed at $304,000 and was annualized over a 10 year life to arrive at a yearly cost of $49,600.
Video Tapes	The present stock of about 1,500 hour length tapes, costing $240 per tape, was allocated over a 12½ year period, which assumes a utilization rate of about 120 tapes per year. (i.e. 10 percent of programming is taped).
Maintenance	This cost was estimated in 1972 by DGEAD personnel at $120,000.

ETV Component (continued)	Basis
Transmission	
Operations	Estimates are based on the operation costs of a system of the same size and power as Channel 5. The cost of transmission equipment is estimated at $2,112,000. Forty percent of operations costs are allocated to TS, with operations costs estimated as follows: 5 percent of facility cost per year for maintenance = $105,600 for power and utilities. To this 40 percent allocation is added the cost of two full-time personnel at $4,000, yielding a total annual cost of $52,000.
Reception	
Receiver	The price of the television set is assumed to be $280 (somewhat high so that it includes the cost of the antenna) annualized over a five year life. A yearly maintenance cost of 10 percent of purchase price is added. With an average class size of 23, an annual receiver cost per student of $4.80 is obtained.

SECTION C: BASIS FOR ANNUALIZING CAPITAL COSTS

Annualized cost is computed from the following equation:

$A = a(r,n)\ P$ where $a\ (r,n) = r\ (1+r)^n\ /\ (1+r)^n - 1$

and A is the annual cost
P is the cost of the capital investment
r is the social cost of capital
n is the lifetime in years of the capital

Throughout this paper r is used at 10 percent. The formula above is used as a standard amortization procedure to make allowance for the fact that due to the ability of capital to earn interest, money today is not worth the same as money in the future. Thus, it is incorrect to simply divide the capital investment by the lifetime in years of the capital to determine an equivalent annual expenditure. Actually, \$8 today is worth more than \$.80 a year over the next ten years. The rate of return of 10 percent was chosen as a reasonable representative of the worth of capital investment to Mexico. For more discussion of the above amortization formula, see Kemeny, et.al. (1962)

Appendix C

Additional Tables for Chapter IV

Achievement/General Ability Learning:

Table One: Pearson Correlations of Achievement and General Ability Learning with Background Factors of Father's and Mother's Education, Father's Occupation and TV Ownership.

Learning Test	Telesecundaria(TS)				Enseñanza Directa(ED)			
	FE	ME	FO	TV	FE	ME	FO	TV
Math 1	$.07^1$	-.01	-.00	.03	$.14^3$	$.13^3$	$.16^3$	.04
Math 2	$.11^3$	.04	$.06^1$	$.11^3$	$.24^3$	$.25^3$	$.24^3$	$.10^3$
Spanish 1	.03	.00	.04	.01	$.19^3$	$.16^3$	$.18^3$	$.16^3$
Spanish 2	$.11^3$	.05	.02	$.07^2$	$.14^3$	$.15^3$	$.15^3$	$.14^3$
Chemistry 1	$.06^1$	$.06^1$	-.03	$.05^1$	$.11^3$	$.17^3$	$.17^3$	.03
Chemistry 2	.04	$.05^1$	-.01	.02	$.21^3$	$.21^3$	$.24^3$	.01
Otis	$.15^3$	$.10^3$	$.15^3$	$.15^3$	--	--	--	--

Note: Numbers above the correlation indicate the levels of significance: 1= $p < .05$; 2= $p < .01$; 3= $p < .001$.

FE= Father's Education; ME= Mother's Education; FO= Father's Occupation; TV= TV Ownership.

Table Two: Pearson Correlations of Achievement and General Ability with Background Factors Stratified by State.

Learning Test	Father's Ed. for TS				Father's Ed. for ED			
	DF	VM	HD	MR	DF	VM	HD	MR
Math 1	$.11^1$	.08	.00	.05	$.15^3$	.06	$.17^3$	.03
Math 2	$.19^3$	-.06	-.11	-.06	$.19^3$	$.23^3$	.04	.10
Spanish 1	.06	-.02	-.02	.03	$.12^1$	$.18^1$	.14	.05
Spanish 2	$.12^1$	$.11^1$	-.07	.02	$.15^2$	-.06	.05	$.14^1$
Chemistry 1	$.12^1$	.04	.00	-.07	$.20^2$	.11	$.24^1$	-.01
Chemistry 2	.07	.05	-.04	$-.14^1$	$.34^3$	.04	.21	$.14^1$
Otis	$.23^3$	$.11^1$	$-.19^2$	.10	--	--	--	--

Learning Test	Mother's Ed. for TS				Mother's Ed. for ED			
	DF	VM	HD	MR	DF	VM	HD	MR
Math 1	.02	.05	-.07	$-.11^1$	$.11^1$	$.18^1$	.16	-.02
Math 2	$.12^1$	-.04	$-.17^2$	-.11	$.16^2$	$.30^3$	$.21^1$	.11
Spanish 1	.00	.01	-.10	-.01	$.15^2$	.11	$.26^1$	$-.14^1$
Spanish 2	$.12^1$	.02	$-.15^1$	-.10	$.19^3$	-.14	.17	.08
Chemistry 1	$.13^2$	$.16^1$	$-.14^1$	-.09	$.25^2$	$.15^1$	$.48^3$	-.05
Chemistry 2	.05	$.11^1$	-.03	$-.11^1$	$.41^3$	.05	$.32^2$	-.08
Otis	$.14^1$	.09	-.11	.09	--	--	--	--

(continued on following page)

Note: Numbers above correlation indicate levels of significance:

1= $p < .05$; 2= $p < .01$; 3= $p < .001$

State Code: DF= Federal District; VM= Valley of Mexico; HD= Hidalgo; MR= Morelos.

Table Two: (continued from previous page)

Learning Test	Father's Occupat. for TS				Father's Occupat.for ED			
	DF	VM	HD	MR	DF	VM	HD	MR
Math 1	.08	$.11^1$	.00	.04	$.20^3$	.06	.06	.12
Math 2	$.10^1$	-.07	$.14^1$	-.05	$.23^3$	$.28^3$	-.14	.03
Spanish 1	-.01	.03	.11	$.13^1$	$.13^1$	.12	.13	-.03
Spanish 2	.02	.01	.06	.00	$.18^2$	-.02	.08	-.04
Chemistry 1	.03	.01	-.08	.03	$.27^3$	$.20^2$	$.31^2$	-.04
Chemistry 2	-.00	.03	-.01	-.05	$.43^3$	.12	.10	.08
Otis	$.12^1$	$.18^2$	$-.13^1$	$.17^2$	--	--	--	--

Learning Test	TV Ownership for TS				TV Ownership for ED			
	DF	VM	HD	MR	DF	VM	HD	MR
Math 1	.00	$.14^2$	$-.14^1$	-.02	-.03	-.01	-.09	.06
Math 2	.08	-.07	$-.12^1$	$.11^1$	.01	.03	-.09	-.03
Spanish 1	.04	$-.13^2$	-.05	$.15^2$	.02	.02	.14	.10
Spanish 2	$.10^1$	$-.12^1$	-.06	.06	.07	-.09	$.24^1$	.08
Chemistry 1	$.11^1$	$.11^1$	$-.18^2$	.01	-.01	-.06	$.36^3$	.09
Chemistry 2	.06	-.08	$-.11^1$	-.04	$.11^1$	-.05	.12	.01
Otis	-.01	.07	.10	$.23^3$	--	--	--	--

Note: Numbers above correlation indicate levels of significance: 1= $p < .05$; 2= $p < .01$; 3= $p < .001$.

State Code: DF=Federal District; VM=Valley of Mexico; HD=Hidalgo; MR=Morelos.

Table Three: Pearson Correlations of Achivement and General Ability Learning with Sex of Student in TS and ED by Global and State responses.

Global Results for Total Samples

Learning Test	Sex:*Telesecundaria(TS)	Sex: Enseñanza Directa(ED)
Math 1	.09^{1}	.06^{1}
Math 2	.10^{2}	.12^{3}
Spanish 1	-.03	.06^{1}
Spanish 2	.01	.02
Chemistry 1	.11^{2}	-.01
Chemistry 2	.05^{1}	.06
Otis	.05^{1}	--

Learning and Sex by State

Learning Test	DF	VM	HD	MR	DF	VM	HD	MR
Math 1	.02	.03	.09	.16^{3}	.07	.02	.19^{2}	-.05
Math 2	-.07	.12^{1}	.04	.12^{1}	.14^{2}	.19^{2}	.16^{1}	-.02
Spanish 1	-.17^{3}	.07	-.01	-.14^{2}	-.01	.20^{2}	.07	.18^{2}
Spanish 2	-.12^{2}	-.04	.04	-.10^{1}	-.00	.10	.02	.05
Chemistry 1	.10^{1}	.09^{1}	.08	.07	-.12^{1}	.10	.03	.08
Chemistry 2	-.08	-.01	-.01	.12^{1}	.00	.19^{2}	-.02	.14^{1}
Otis	-.01	.05	-.02	.06	--	--	--	--

Note: Numbers above the correlations indicate the levels of significance: 1= $p < .05$; 2= $p < .01$; 3= $p < .001$.

* Positive correlations favor boys; negative, girls.

Student Aspirations

Table Four: Distributions of four Aspiration Measures for TS and ED Groups, Stratified by State.

Educational Aspirations (percent)

	Telesecundaria(TS)				Enseñanza Directa(ED)			
Educational Level	DF	VM	HD	MR	DF	VM	HD	MR
Finish Secondary	8.4%	12.5%	17.9%	19.1%	2.7%	6.7%	7.0%	6.5%
Voc./Normal Sch.	34.5	55.3	57.0	58.7	26.4	39.4	32.6	50.0
Higher Studies	56.4	32.0	24.4	22.3	60.5	53.4	60.4	43.6

Occupational Aspiration (percent)

	Telesecundaria(TS)				Enseñanza Directa(ED)			
Occupational Level	DF	VM	HD	MR	DF	VM	HD	MR
Lower	8.6%	17.6%	6.2%	3.7%	2.6%	4.1%	3.6%	2.4%
Middle	33.7	49.5	63.1	66.3	27.0	32.3	32.5	47.5
Higher	58.0	32.3	30.3	30.3	69.6	63.2	63.7	50.6

Salary Aspirations (percent)

	Telesecundaria(TS)				Enseñanza Directa(ED)			
Salary Level	DF	VM	HD	MR	DF	VM	HD	MR
Low (under U.S. $200/month)	60.4%	75.0%	74.9%	82.7%	38.7%	59.0%	72.0%	81.9%
High (over U.S. $200/month)	39.6	25.0	25.1	17.3	61.3	41.0	28.0	18.1

Certainty of Reaching Educational Goals (percent)

	Telesecundaria(TS)				Enseñanza Directa(ED)			
Degree of Certainty	DF	VM	HD	MR	DF	VM	HD	MR
Sure/very sure	76.9%	63.8%	61.8%	61.1%	87.6%	71.0%	76.2%	69.4%
Not sure	23.1	35.5	38.3	39.0	12.2	28.7	23.8	30.6

Table Five: Educational Aspiration of TS and ED Students by Sex.

Ed. Aspiration/Sex: Global Results (percent)

Level of School Desired	Boys TS	Boys ED	Girls TS	Girls ED
Finish Secondary	16.0%	5.3%	10.1%	4.2%
Finish Vocational /Normal	38.6	24.0	70.1	49.7
Finish Sen. High School	11.5	5.9	5.6	6.1
Finish University of Politechnic	33.5	64.8	13.5	39.2

Educational Aspirations/Sex/State (percent)

Enseñanza Directa

Level of School Desired	DF Boy	DF Girl	VM Boy	VM Girl	HD Boy	HD Girl	MR Boy	MR Girl
Finish Secondary	2.7	3.7	6.1	8.6	8.3	3.9	7.0	7.6
Finish Vocational /Normal	13.1	42.2	18.2	48.6	42.2	61.0	28.7	57.0
Higher Education	84.2	54.0	74.8	42.9	49.5	35.1	64.3	35.4

Telesecundaria

Level of School Desired	DF Boy	DF Girl	VM Boy	VM Girl	HD Boy	HD Girl	MR Boy	MR Girl
Finish Secondary	7.9	10.1	24.5	9.8	26.6	11.8	14.3	7.8
Finish Vocational /Normal	25.4	60.6	42.4	75.0	46.0	70.8	48.0	73.3
Higher Education	66.3	27.3	32.4	14.3	27.4	17.4	37.4	19.0

Table Six: Pearson Correlations for Student Aspirations by Sex and Age for TS and ED.

	Telesecundaria(TS)		Enseñanza Directa(ED)	
Aspiration	Sex*	Age	Sex	Age
Educational Asp.	$.21^3$	$-.08^2$	$.23^3$	$-.09^2$
Occupational Asp.	$.20^3$	$-.04$	$.29^3$	$-.03$
Salary Asp.	$.11^3$	$-.00$	$-.02$	$-.05$

Note: Numbers above correlations indicate the level of significance: 1= $p < .05$; 2= $p < .01$; 3= $p < .001$.

* Positive correlations on sex factor favors boys.

Table Seven: Pearson Correlations for Aspirations by Achievement and General Ability Learning for TS and ED.

Achievement Learning Test	Telesecundaria(TS)			Enseñanza Directa(ED)		
	EdAsp	OccupAsp	SalAsp	EdAsp	OccupAsp	SalAsp
Math 1	$.09^3$	$.09^3$	.00	$.17^3$	$.08^1$	$.15^3$
Math 2	$.17^3$	$.14^3$	$.14^3$	$.25^3$	$.15^3$	$.23^3$
Spanish 1	$.14^3$	$.05^1$	$.08^1$	$.21^3$	$.16^3$	$.22^3$
Spanish 2	$.15^3$	$.06^1$	$.10^3$	$.18^3$	$.14^3$	$.16^3$
Chemistry 1	$.17^3$	$.08^2$	$.09^2$	$.11^2$	.04	$.10^2$
Chemistry 2	$.18^3$	$.07^1$	$.09^2$	$.18^3$	$.11^2$	$.10^2$

General Ability Learning Test	Telesecundaria(TS)		
	EdAsp	OccupAsp	SalAsp
Otis	$.24^3$	$.16^3$	$.12^3$
Analogies	$.13^3$	$.13^3$	$.17^3$
Number Skill	$.20^3$	$.12^3$	$.11^3$

Note: Numbers above correlations indicate the level of significance:
1= $p < .05$; 2= $p < .01$; 3= $p < .001$.

Table Eight: Pearson Correlations for Aspiration by After Scores of Achievement and General Ability Learning by Two States for TS and ED.

	Telesecundaria					
	Urban State(DF)			Rural State(MR)		
Achievement Learning Test	EdAsp	OccupAsp	SalAsp	EdAsp	OccupAsp	SalAsp
Math 2 (June)	.06	-.02	$.11^1$	$.15^2$	$.21^3$	.08
Spanish 2 (June)	.04	-.09	.07	$.20^3$	.05	.05
Chemistry 2(June)	$.19^3$	-.01	$.13^2$	$.17^2$	$.17^2$	.05
Otis	$.20^3$	$.11^1$	.09	$.23^3$	$.15^2$	$.13^1$

	Enseñanza Directa					
	Urban State(DF)			Rural State(MR)		
Achievement Learning Test	EdAsp	OccupAsp	SalAsp	EdAsp	OccupAsp	SalAsp
Math 2 (June)	$.25^3$	$.19^3$	$.25^3$	.06	.03	-.11
Spanish 2 (June)	$.14^2$	$.12^1$	$.20^3$	$.31^3$	.12	-.00
Chemistry 2(June)	$.25^3$	$.14^1$	$.29^3$	$.14^1$	$.15^1$	-.09

Note: Numbers above correlations indicate the level of significance: 1= $p < .05$; 2= $p < .01$; 3= $p < .001$.

Table Nine: Pearson Correlations for General Attitudes and Achievement and General Ability Learning for TS and ED.

Telesecundaria (TS)

Attitude Item	Mt1	Mt2	Sp1	Sp2	Ch1	Ch2	Otis	Anal	Num
*1.Good job/change	$-.04$	$-.14^3$	$-.10^3$	$-.10^3$	$-.09^2$	$-.06^1$	$-.17^3$	$-.15^3$	$-.14^3$
5.Good job/learning	$-.11^3$	$-.19^3$	$-.17^3$	$-.21^3$	$-.15^3$	$-.13^3$	$-.26^3$	$-.23^3$	$-.20^3$
7.Good pay/interests	$-.05^1$	$-.10^3$	$-.13^3$	$.11^3$	$-.07^2$	$-.08^2$	$-.19^3$	$-.14^3$	$-.07^1$
2.Small town better	$-.05^1$	$-.05^1$	$-.02$	$-.04$	$.01$	$-.02$	$-.14^3$	$-.10^3$	$-.08^2$
6.Stability bad	$.05^1$	$.07^2$	$.02$	$.08^2$	$.05^1$	$.03$	$.11^3$	$.13^3$	$.06^1$
3.Want many things	$.05^1$	$.08^2$	$.04$	$.03$	$.05^1$	$.04$	$.08^2$	$.07^2$	$.12^3$
9.Fatalism	$-.09^3$	$-.14^3$	$-.15^3$	$-.12^3$	$-.07^2$	$-.06^1$	$-.17^3$	$-.12^3$	$-.15^3$
4.Modern/change ideas	$.03$	$-.02$	$.00$	$-.04$	$.04$	$-.03$	$-.02$	$-.03$	$-.00$
8.International news not important	$-.13^3$	$-.20^3$	$-.19^3$	$-.17^3$	$-.13^3$	$-.14^3$	$-.20^3$	$-.18^3$	$-.16^3$

(continued following page)

Note: Numbers above correlations indicate the levels of significance:

$1 = p < .05$; $2 = p < .01$; $3 = p < .001$.

*Numbers refer to the attitude statements listed in Figure IV-2, pg. 87a.

Table Nine: (Continued from previous page)

	Enseñanza Directa (ED)					
Attitude Item	Mt1	Mt2	Sp1	Sp2	Ch1	Ch2
1.Good job/change	$-.21^3$	$-.28^3$	$-.17^3$	$-.20^3$	$-.13^3$	$-.14^3$
5.Good job/learning	$-.15^3$	$-.21^3$	$-.17^3$	$-.16^3$	$-.13^3$	$-.21^3$
7.Good pay/interests	$-.17^3$	$-.28^3$	$-.10^2$	$-.11^2$	$-.12^3$	$-.16^3$
2.Small Town better	$-.09^1$	$-.11^2$	-.05	-.05	$-.09^1$	-.06
6.Stability bad	.05	$.11^2$	$.15^3$	$.10^2$	.06	$.07^1$
3.Want many things	$-.11^2$	-.05	-.01	.02	.05	-.00
9.Fatalism	$-.09^2$	$-.15^3$	$-.11^2$	$-.11^2$	-.02	$-.15^3$
4.Modern/change ideas	$.07^1$	$.08^1$	.04	$.07^1$	$.07^1$	$.12^2$
8.International news not important	$-.15^3$	$-.24^3$	$-.13^3$	$-.11^2$	$-.10^2$	$-.22^3$

Note: Numbers above correlations indicate levels of significance:

1= $p < .05$; 2= $p < .01$; 3= $p < .001$.

Table Ten: Pearson Correlations for General Attitudes and State, Demographic and Background and Aspiration Measures for TS and ED.

	Telesecundaria (TS)								
Attitude Items	State	Sex	Age	FE	ME	TV	EdAsp	OcuAsp	SalAsp
*1.Good job/change	$-.14^{3}$	-.04	$.08^{2}$	$-.11^{3}$	$-.08^{2}$	$-.08^{2}$	$-.16^{3}$	.01	.01
5.Good job/learning	$-.16^{3}$	.02	.04	$-.05^{1}$	-.03	$-.15^{3}$	$-.16^{3}$	.01	-.00
7.Good pay/interests	$-.05^{1}$	$.05^{1}$	.01	$-.15^{3}$	$-.12^{3}$	-.03	$-.17^{3}$	-.03	$.05^{1}$
2.Small Town better	$-.12^{3}$	$.05^{1}$	-.00	$-.05^{1}$	$-.06^{1}$	-.03	$-.08^{2}$	.01	-.03
6.Stability bad	$.06^{1}$	.04	.02	.04	.00	.03	$.06^{1}$	-.00	.03
3.Want many things	.03	.02	.05	-.04	-.01	.03	.00	.03	.00
9.Fatalism	$-.08^{2}$	$-.08^{2}$	$-.05^{1}$	$-.06^{1}$	-.02	-.03	$-.13^{3}$	.02	.01
4.Modern/change ideas	-.02	.05	.01	.01	.01	-.04	.02	-.01	.04
8.International news not important	$-.12^{3}$	.00	.01	$-.08^{2}$	$-.06^{1}$	$-.06^{1}$	$-.14^{3}$	-.01	.02

(continued on following page)

Note: Numbers above the correlations indicate the level of significance:

1= $p < .05$; 2= $p < .01$; 3= $p < .001$.

*Numbers refer to the attitude statements listed in Figure IV-2, pg. 87a.

Table Ten: (continued from previous page)

	Enseñanza Directa(ED)								
Attitude Item	State	Sex	Age	FE	ME	TV	AdAsp	OcuAsp	SalAsp
1.Good job/change	$-.14^3$	.00	.04	$-.22^3$	$-.18^3$	$-.14^3$	$-.21^3$	$-.13^3$	.02
5.Good job/learning	$-.18^3$	-.03	.04	$-.17^3$	$-.13^3$	$-.14^3$	$-.18^3$	$-.10^2$	-.01
7.Good pay/interests	$-.14^3$	$.07^1$	.05	$-.14^3$	$-.14^3$	$-.07^1$	$-.08^2$	-.06	-.05
2.Small Town better	$-.12^3$	$.18^3$	.05	$-.14^3$	$-.17^3$	$-.12^3$	$-.06^1$	.01	-.01
6.Stability bad	$.13^3$	$.07^1$	-.00	$.11^3$	$.09^2$	.05	$.08^2$	$.12^2$	.02
3.Want many things	-.05	.03	$.08^2$	$-.13^3$	$-.17^3$	-.03	-.05	-.05	-.03
9.Fatalism	-.01	-.03	-.04	-.04	.02	$-.07^1$	$-.08^1$	$-.07^1$	-.01
4.Modern/change ideas	.02	.03	.03	.01	-.00	.04	.04	$.07^1$	-.01
8.International news not important	$-.13^3$	$.06^1$	.04	$-.17^3$	$-.13^3$	-.03	$-.12^3$	$-.06^1$	-.01

Note: Numbers above the correlations indicate the levels of significance:

1= $p < .05$; 2= $p < .01$; 3= $p < .001$.

Appendix D

Telesecundaria Programming: Costs of Video-Taping Production*

(thousands of 1972 U.S. Dollars)

Cost Component	Year 1	Year 2	Year 3	Each Year After
Method I: Cost Reducing				
1) Video-Tape**	$ 58	$ 58	$ 58	$ 58
2) Tele-Teachers	104	75	47	21
3) Production Personnel & Administration	220	162	102	44
4) Equipment Maintenance	120	89	56	24
5) Studios	15	15	15	15
6) Studio Equipment	50	50	50	50
7) TOTAL PRODUCTION COSTS	$567	$449	$328	$212
Method II: Quality Improvement				
8) Added Technical*** Assistance	$104	$104	$104	$ 21
9) TOTAL PRODUCTION COSTS	$671	$553	$432	$233

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* The analysis assumes the taping proceeds one grade at a time for the first three years and that 20 percent of the programs are re-taped each year. Beginning in the first year of taping, the costs of tele-teachers, production personnel and equipment maintenance are assumed to decrease from their present levels in (see Table II-3) proportion to the decreased production load. Studio and studio equipment costs are assumed to remain at their present level, although less of each should actually be needed in the future.

** Programming for the three grades consists of 1200 hours per year, and the tapes have a five-year life. The simplifying assumption is made that on the average 240 tapes are acquired annually. Actually, this expense for video-tapes probably will not begin until year 6, given the size of the present stock of tapes.

*** To improve quality, it is assumed that teaching and/or technical assistance is purchased for the first three years at a cost equal to the amount presently spent on the tele-teachers and at 20 percent that amount thereafter.

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